NOVEMBER 1961

Distribution This Issue: 61,000

NEREM 61

ELECTRONIC PRODUCTS

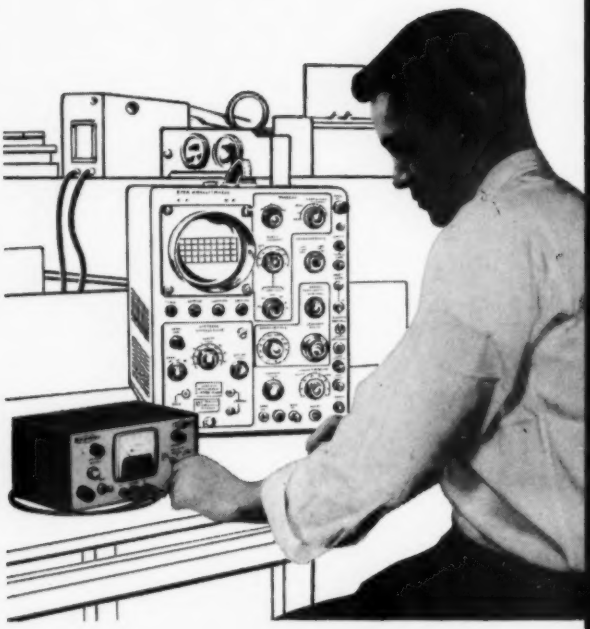
MAGAZINE & CLIP FILE

THE INDUSTRY'S NEW PRODUCT MONTHLY - FEATURING: SPECS • APPLICATIONS • AVAILABILITY • PRICES

Silicon Power Transistor in TO-5 Case Operates Without Heat Sink . . . P. 28

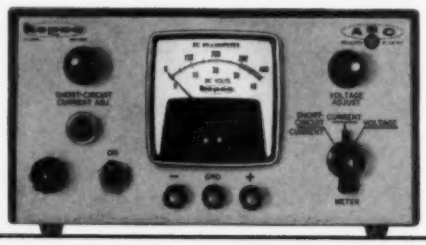
ABC
REGULATED DC SUPPLY

test-bench instrument



or systems component

KEPCO "ABC" POWER SUPPLY



MODEL ABC 30-0.3M

MODEL	DC OUTPUT RANGE VOLTS	CURRENT	DIMENSIONS H	W	D	PRICE
ABC 30–0.3	0–30	0–300ma.	4¼"	8½"	5⅝"	$ 99.00
ABC 40–0.5	0–40	0–500ma.	4¼"	8½"	9⅝"	$139.00
ABC 7.5–2	0–7.5	0–2 amp	4¼"	8½"	9⅝"	$139.00
ABC 15–1	0–15	0–1 amp	4¼"	8½"	9⅝"	$139.00

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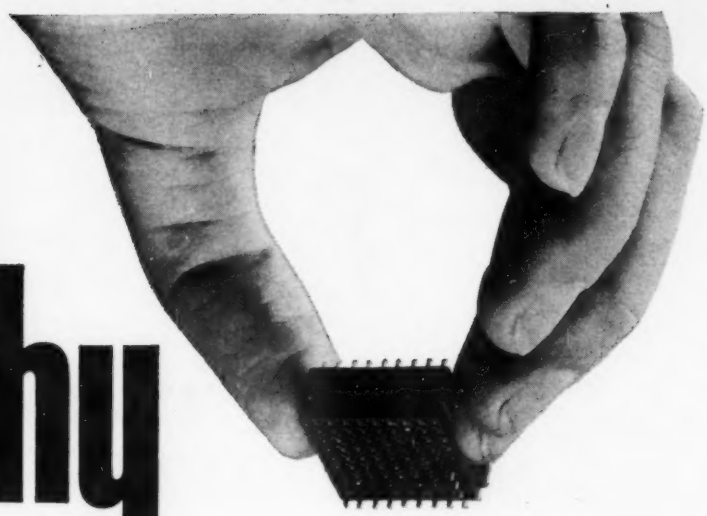

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NOVEMBER 1961

Vol. 4, No. 6

ELECTRONIC PRODUCTS

MAGAZINE & CLIP FILE

Publisher
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60 Madison Ave., Hempstead, N. Y.
(516) IVanhoe 6-7755

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THIS MONTH'S COVER...

Depicts the low heat generation of the miniaturized power transistor by its location in the coolest portion of the symbolic heat spectrum

ANNOUNCING THE FAIRCHILD FD600

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for surface protection and reliability

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for high speed, high conductance

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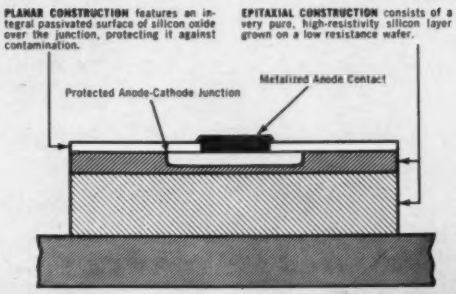
FAIRCHILD PLANAR EPITAXIAL DIODE STRUCTURE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EPITAXIAL CONSTRUCTION consists of a very pure, high-resistivity silicon layer grown on a low resistance wafer.
Metalized Anode Contact
Protected Anode-Cathode Junction

EPITAXIAL CONSTRUCTION

A thin pure silicon epitaxial layer provides high breakdown voltage, low capacitance and fast reverse recovery. Added mechanical strength, low resistance path to the collector connection are made possible by thicker, low resistivity supporting wafer.

SILICON PLANAR RELIABILITY

An integral silicon oxide surface permanently protects the junction against contamination from the start of manufacture.

ADVANTAGES

Increases current handling capabilities of diode matrices without reducing speed. Decreases number of gate amplifiers between diode gates in series diode logic circuitry.

APPLICATIONS

High-speed, high conductance applications such as avalanche circuitry; core drivers; logarithmic amplifiers for pulse applications; critical circuitry requiring high conductance and low internal power dissipation, without sacrificing speed.

FD600 GUARANTEED CHARACTERISTICS

Forward Current	:	200 mA (min.) @ 1 Volt
Breakdown Voltage	:	75 Volts (min.) @ 5 μA
Capacitance	:	2 $\mu\mu$f (max.) @ 0 Volts
Reverse Current	:	50 mμA (max.) @ 50 Volts
Power Dissipation	:	500 mW @ 25°C

REVERSE RECOVERY TIME SPECIFIED FOR YOUR USE

● For magnetic memory applications

Fast recovery with no turn-off current required

t_{rr}=20 mμsec (I_F = 200 mA, I_R = 0 mA)

● For current mode switching in driver applications

Fast recovery with high forward conductance

t_{rr}=2 mμsec (I_F=I_R=10 to 400 mA)

● For diode logic applications

Fast recovery with low reverse current

t_{rr}=4 mμsec (I_F=10 mA, I_R=1 mA, recovery to 0.1 mA)

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ELECTRONIC PRODUCTS Magazine is published monthly by Tech Publishers, Inc., 60 Madison Ave., Hempstead, N. Y., Copyright 1961 by Tech Publishers, Inc.
Other publications: eem — Electronic Engineers Master, Radio-Electronic Master.

Information contained herein is subject to change without notice. No responsibility is assumed by the publisher for its accuracy or completeness.

Controlled circulation postage paid at Hempstead, N. Y. and at Garden City, N. Y.

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New Bourns Precision Potentiometer Resolves the Quality-Price Dilemma!

NUMBER 18—NEW PRODUCT SERIES

Here is military reliability in a competitively-priced industrial potentiometer. Bourns wirewound 10-turn Model 3500 measures just ⅞" in diameter by 1" long—shorter by ½" than units available elsewhere—yet has a resistance element 20% longer than that of comparable potentiometers.

Fully meeting military requirements for steady-state humidity, Model 3500 can also be provided at a 10% premium to meet the cycling humidity specs of MIL-STD-202, Method 106. It's the only ⅞" 10-turn potentiometer guaranteed to meet this spec. Its published characteristics incorporate wide safety margins.

Reliability insurance is provided by the exclusive Bourns Silverweld® bond between terminal and resistance wire. Virtually indestructible under thermal or mechanical stress, this termination eliminates a chief cause of potentiometer failure. In addition, a special close-tolerance rotor almost completely does away with backlash.

Model 3500 is also subjected to the rigorous double-check of Bourns' exclusive Reliability Assurance Program. In short, every possible step is taken to ensure that the performance you specify is the performance you get. Write for complete data.

Resistances	500Ω to 125K, ±3%, std. (to 250K spl.)
Linearity	±0.25% std.
Power rating	2w at 70°C
Operating temp.	−65° to +125°C
Mech. life	2,000,000 shaft revolutions

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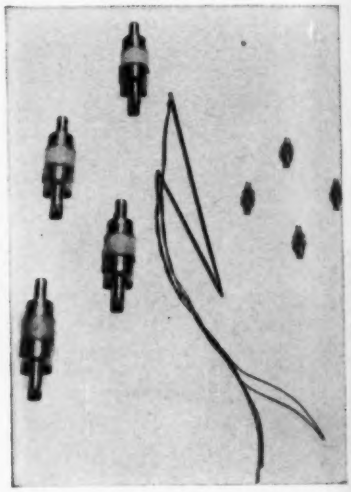
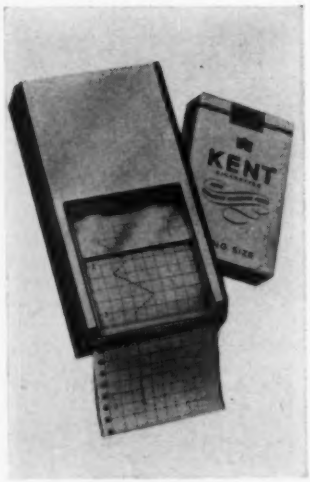
HIGHLIGHTS OF THE MONTH

Selected by the EP staff as items of unusual interest and application for the designer. Complete descriptions on pages shown.

Semiconductor cooling kit permits designers to test circuits in any desired layout and environment. **p. 76**



Epitaxial microwave varactors exhibit cut-off frequencies to 150 Gc at −45v breakdown. p. 72

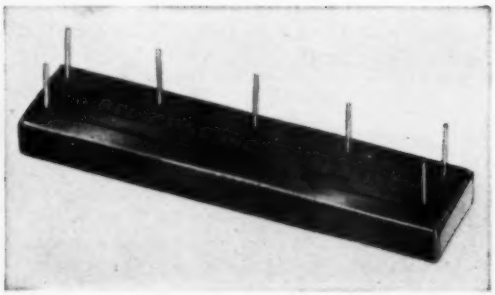


Miniature inkless recorder stores voltage, current, temperature data on pressure sensitive paper. p. 38

Latch-in fault indicator, ¾" dia, provides permanent check of circuit operation. p. 32

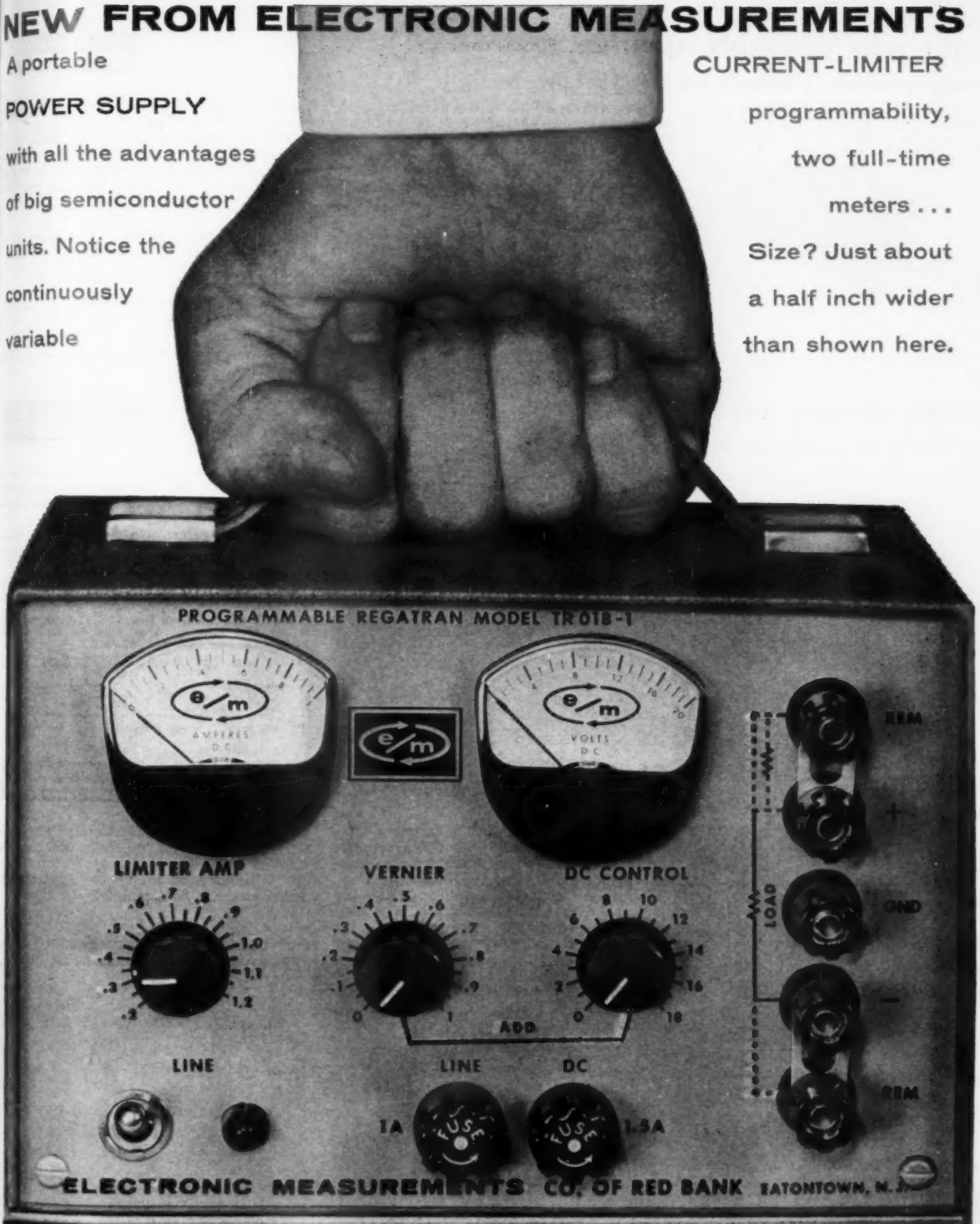
Epoxy silicone rubber potting compound cures and bonds to itself and most other materials. p. 42

Millimicrosecond delay lines have delay times of 5 to 100 nanosec for high speed pulse circuitry. p. 20



NEW FROM ELECTRONIC MEASUREMENTS

A portable **POWER SUPPLY** with all the advantages of big semiconductor units. Notice the continuously variable **CURRENT-LIMITER** programmability, two full-time meters . . . Size? Just about a half inch wider than shown here.



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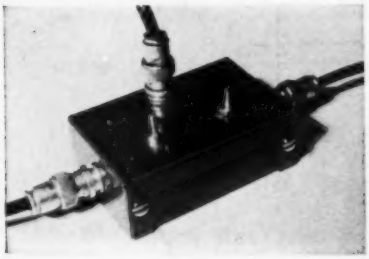
ULTRA HIGH IMPEDANCE AMPLIFIER [*Denro Lab*]

eem File System Sec. electronic engineers master 1100

Frequency Response 5 Cycles To 100 Kc Within 1 Db



Designed as an a-c or d-c amplifier without a warm-up period or drift problems, this solid state ultra high impedance amplifier provides negligible loading on a source to be measured. The only active element used to produce amplification is a diffused silicon diode with low reverse leakage and low capacitance.

The unit has a frequency response of 5 cycles to 100 kc within 1 db; 3 cycles to 300 kc within 3 db. Input impedance is 15,000 megohms shunted by 1 to 1.5 $\mu\mu$f (plus input terminal capacitance BNC 1 to 2 $\mu\mu$f). Output impedance is 1 megohm shunted by 3 to 10 $\mu\mu$f.

With an input to output impedance of 10,000 to 20,000 (both adjustable to match source and load), this unit has a power gain of up to 30 to 35 db. Energy requirement for operation is 30 mw max.

PRICE: $87.00. **AVAILABILITY:** 2 wks. **MFR:** Denro Lab, 2801 15th St., N. W., Dept EP, Washington, D. C.

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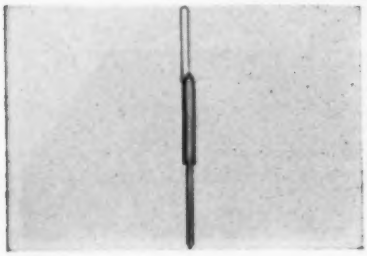
FOLDED COAXIAL ANTENNAS [*Motorola Communications & Electronics Inc.*]

eem File System Sec. electronic engineers master 1200

For 136-174 Mc Two-Way Radio Base Stations



Utilizing a center-fed half-wave design with a folded radiating element and a coaxial skirt section, this three-antenna series eliminates projecting ground plane rods to simplify installation, reduce pattern distortion and minimize ice damage. Parasitic elements provide specialized radiation patterns in the cardioid TAD 6080 and unidirectional TAD 6090 series. The TAD 6070 omnidirectional series have increased radiating apertures and low angles of radiation.

Forward gain in the direction of max signal strength for the cardioid series is 3 db, and 5.8 db for the unidirectional series over the standard center-fed half-wave dipole antenna.

Antennas maintain a vswr of less than 1.5:1, and have an impedance of 50 ohms.

PRICE: $54.00 to $85.00. **AVAILABILITY:** 5 to 7 wks. **MFR:** Motorola Communications & Electronics Inc., 4501 W. Augusta Blvd., Dept EP, Chicago 51, Ill. **SALES MGR:** Homer Marrs, SP 2-6500; for nearest rep see **eem** p. 1791 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 743, 902

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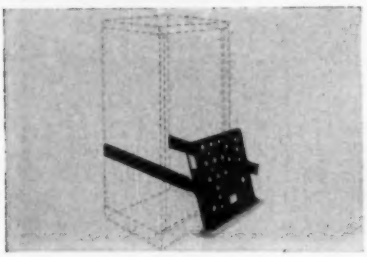
UNIVERSAL CHASSIS SLIDE [*Metal-Craft, Inc.*]

eem File System Sec. electronic engineers master 1400

Eight Sizes Ranging From 10" To 24"



This universal chassis slide comes complete for detent, tilt or nontilt assembly, and front and back mounting, front mounting only or side mounting only.

Features include: a permanent dry lubrication that minimizes abrasion and corrosion; a simplified detent that facilitates ease of control when manipulating the chassis, locks in any of seven positions and withstands high g pressures without unlocking; a pushbutton release for chassis removal; wafer-thin construction of slide and detent assembly; a device that locks the chassis automatically into position when it is moved into the cabinet. Punched with a universal pattern, the slide will support all types of electronic packages up to 300 pounds.

PRICE: Contact Mfr. below. **AVAILABILITY:** 2 wks. **MFR:** Metal-Craft, Inc., 34 Burgess Pl., Dept EP, Wayne, N. J.

Check **132** *Reader Service Card* 11/61

BALL BEARING SLIDE [*Grant Pulley & Hardware Corp.*]

For Standard Or Miniature Equipment

This three-section, extruded-aluminum slide is said to be the smallest, thinnest, ball bearing slide made for standard or miniature equipment.

Rated at a minimum load capacity of 100 lb per pair, Micro-Slide is capable of supporting most electronic and industrial equipment.

Its size ($\frac{5}{16}$" thick x $1\frac{5}{8}$" high) enables the slide to be used under space restrictive conditions of the most extreme type.

Continuous ball-bearing action assures smooth, movement and rapid servicing. Slides can be completely extended, bringing all operating components to fully accessible servicing position for maintenance.

A quick-disconnect feature allows removal of the chassis from the rack or cabinet.

PRICE: Contact Sales Mgr below. **AVAILABILITY:** 4 wks. **MFR:** Grant Pulley & Hardware Corp., High St., Dept EP, West Nyack, N. Y. **SALES MGR:** Jerry Bross, EL 8-4400; for nearest rep see **eem** p. 1737 (1961-62 Ed.)

Check **133** *Reader Service Card* 11/61

POLAROID®

2 nanoseconds/cm: impossible to photograph until now

Polaroid has a new film that is so fast, it will reproduce scope traces that are almost invisible to the naked eye. The one above, a scintillation pulse, has never been photographed until now. Pulse duration was ten nanoseconds. Scope sweep speed was 2 nanoseconds/cm. *The new 10,000-speed Polaroid PolaScope Land film produced a finished usable print ten seconds after exposure.*

The maximum writing speed of the 10,000-speed film is about twice that of the Polaroid Land 3000-speed film, which is currently the standard for high speed photography. The new film not only gets "impossible" pictures, it also produces far better shots of slower pulses and steady state waveforms. Because of its high speed, less light is required; camera aperture and scope intensity can be reduced considerably, producing sharper pictures.

And besides oscillography, the PolaScope film opens up new possibilities in applications where light is at a premium, such as photomicrography and metallography. It is not suited, however, for pictorial work due to its high contrast and relatively coarse grain.

PolaScope film (designated Type 410) is packed twelve rolls to a carton. The price is actually lower than the 3000-speed film.

The film can be obtained through industrial photographic dealers. For the name of the dealer nearest you, write to Technical Sales Department, Polaroid Corporation, Cambridge 39, Massachusetts.

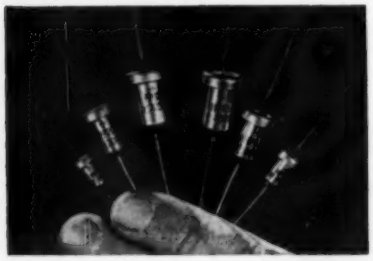
New Polaroid Land 10,000-speed film for oscillography.

Check **6** *Reader Service Card*

ELECTROLYTIC TANTALUM CAPACITORS [*Fansteel Metallurgical Corp.*]

eem File System Sec. 1500 electronic engineers master

Temperature Range —55°C To 125°C — 1.75 μf To 560 μf



These electrolytic tantalum capacitors offer up to double the original capacitance values in the same three basic case sizes.

Type HP have d-c working voltage ratings of 4 to 85 volts and temperature ratings of —55°C to 125°C.

Type PP operate within a temperature range of —55°C to 85°C and have voltage ratings of 6 to 125 volts. Tolerance for grade 1 capacitors in both types is ±10%.

A leak-proof, crimped-cap used in the units is said to withstand low-atmospheric pressure in high-altitude environments.

Units are available with and without insulating sleeves.

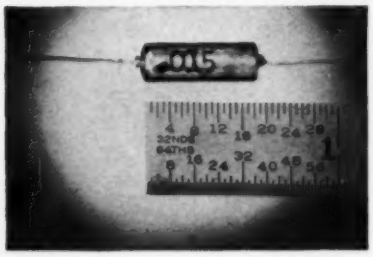
Applications include their use in computer, data processing, transmission and receiving equipment.

PRICE: $3.00 to $12.30. **AVAILABILITY:** From stock. **MFR:** Rectifier-Capacitor Div., Fansteel Metallurgical Corp, Dept EP, North Chicago, Ill. **SALES MGR:** P. Weirich, 312-336-4900; for nearest rep see eem p. 1719 (1961-62 Ed.)

Check **134** *Reader Service Card 11/61*

MINIATURE CAPACITORS [*Component Research Co., Inc.*]

Metallized Mylar—Special Units Available With 0.1% Stability



Capacitance values of the Type MM units measured at any two corresponding temperature points taken in any two successive temperature cycles from —10°C to 85°C are within 0.2% of each other. From —62°C to 125°C capacitance values are within 0.3%.

Capacitors meet requirements of Mil C-25A or Mil E-5272 for shock and vibration and applicable specifications relative to corrosion, humidity, and moisture resistance per Mil C-25A, Mil E-5272, or Mil E-6400.

These hermetically sealed units are available in a capacitance range from 0.01 to 10 μf with standard tolerances of 10, 5, 2, and 1%.

The capacitors withstand a test voltage of 150% of rated voltage at 25°C, and of 125% at 90°C for 2 minutes.

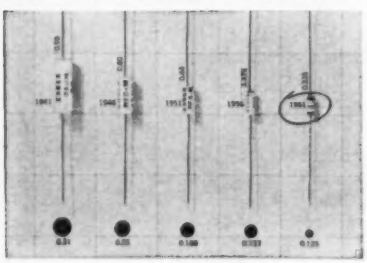
PRICE: $1.00 up (prod qty). **AVAILABILITY:** Stock to 2 days. **MFR:** Component Research Co., Inc., 3019 S. Orange Dr., Dept EP, Los Angeles 16, Calif. **SALES MGR:** D. Kellerman, WE 3-1105; for nearest rep see eem p. 1684 (1961-62 Ed.)

Check **135** *Reader Service Card 11/61*

SUBMINIATURE INDUCTORS [*Nytronics, Inc.*]

eem File System Sec. 1800 electronic engineers master

Have Volume Of 0.0042 Cubic Inch



Offering designers of miniature circuits small inductors in a wide range of values from 0.10 to 1,000 microhenrys, Wee-Wee Ductors (circled in photo) are encapsulated, nonflammable, and r-f shielded.

The units weigh 0.38 gram and are 0.125" in diameter by 0.335" in length. They meet Mil-C-15305 B, Amendment 1 and color coding specifications.

Their d-c resistance ranges from 0.112 ohm for the 0.10 μh unit to 52.0 ohms for the 1,000 μh inductor.

Incorporating excellent shielding characteristics, two 1,000 μh units, when assembled side-by-side, exhibit less than 3% coupling.

Two No. 24 tinned copper wire leads, approximately 1.3" in length, are provided for mounting purposes.

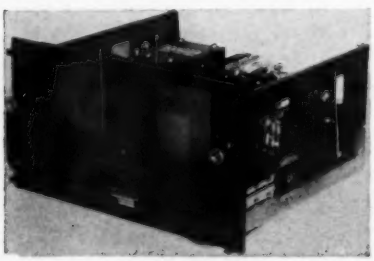
PRICE: $0.80 to $1.50. **AVAILABILITY:** From stock. **MFR:** Nytronics, Inc., 550 Springfield Ave., Dept EP, Berkeley Heights, N. J. **SALES OFFICES:** See eem p. 1800 (1961-62 Ed.)

Check **136** *Reader Service Card 11/61*

DUAL DISPLAY TV MONITOR [*RMS Associates, Inc.*]

eem File System Sec. 1900 electronic engineers master

Transistorized Unit Gives Two 5½" x 5½" Presentations



Type M20002 is designed to military specifications. Units are on 10½" high rack-mounting chassis and are suited for installation in ground or air transportable monitoring stations.

Conventional 3:4 aspect ratios are also available. Two independent 5.5 mc video amplifiers and two independent horizontal deflection amplifiers are used. The vertical deflection amplifier is common for both monitors.

These dual monitors are 17" deep and weigh less than 35 lb. Power consumption is less than 150 watts.

Type M20001, which consumes less than 75 watts, is the same as the M20002 but operates from a group of power supplies normally available in ground equipment.

PRICE: M20001 $5,750.00; M20002 $6,350.00. **AVAILABILITY:** 60 to 90 days. **MFR:** RMS Associates, Inc, 805 Mamaroneck Ave, Dept EP, Mamaroneck, N.Y. **SALES MGR:** C. Machover, OW 8-5802; for nearest rep see eem p. 1945 (1961-62 Ed.)

Check **137** *Reader Service Card 11/61*

HERE'S ONE WAY
TO GET WORK DONE WHEN WIRE-WOUND POT
FAILURES OCCUR...

C.I.C. PRECISION FILM POTENTIOMETERS...

HERE'S ONE WAY TO SOLVE SERVO "HUNTING" PROBLEMS...

How To Improve Response
Servos Using Wire-Wound Pots...

...sers Who Don't Know About
... Film Pots Might Solve "Short-Life" Pot Problems
...ONE Way...

THE EASY SOLUTION TO ALL POT PROBLEMS

*Only C.I.C. Film Potentiometers can meet your most demanding specifications because they feature:

- Infinite Resolution
- Inherent Reliability
- Precision Linearity
- Low Operational Noise
- Multi-Million Cycle Life

Write for Your FREE Copy, Today...

This booklet presents some novel "fixes" for frantic users of **wire-wound pots** who just can't tolerate the resulting problems. More important — you'll find the one good solution to **all** pot problems.

"first in film pots"

CIC

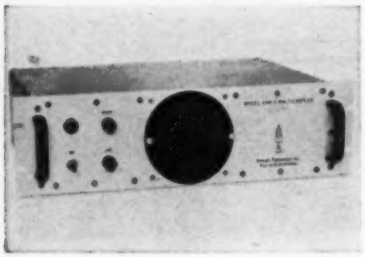
COMPUTER INSTRUMENTS CORPORATION
92 MADISON AVENUE • HEMPSTEAD, L. I., NEW YORK

Check 7 Reader Service Card

VHF MULTICOUPLER [*Applied Technology Inc.*]

eem File System Sec. electronic engineers master 1900

For Reconnaissance And Monitor Receiving Systems



Model VHM-3 vhf multicoupler is a broadband, low-noise amplifier that can couple as many as six receivers to one antenna system over the 15 to 70-mc range. It provides minimum interaction, intermodulation distortion, and spurious modulation, while maintaining a low overall noise figure.

The unit's noise figure is 4 db with a nominal gain of 16 db for each of the six outputs. Ripple of the r-f passband is less than 3 db. Isolation between outputs is 60 db min and 90 db min between any output and the input. Intermodulation products between two −37 dbm signals are at least 40 db down from the main responses.

The multicoupler is for use in a 50-ohm system; type N female connectors are employed.

The rack mounting unit has panel height of 5¼" and chassis depth of 13¼".

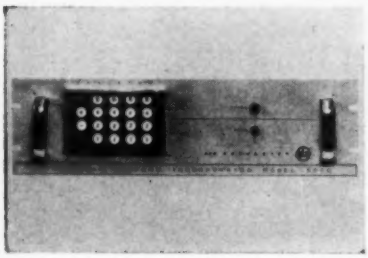
PRICE: $1,985.00. **AVAILABILITY:** 60 days. **MFR:** Applied Technology Inc., 930 Industrial Ave., Dept EP, Palo Alto, Calif., **SALES OFFICES:** See **eem** p. 1651 (1961-62 Ed.)

Check **138** *Reader Service Card* 11/61

ANALOG-TO-DIGITAL CONVERTER [*Non-Linear Systems, Inc.*]

eem File System Sec. electronic engineers master 2000

15,000 Voltage Readings Per Second—Accuracy ±0.01% Plus 1 Digit



Transistorized, Model 5000 converter features high-frequency resistors, a stable comparison amplifier, electronic switches and a temperature-regulated zener diode reference voltage supply. Operation is bipolar. Another version, the Model 5000B, provides output in straight binary.

Both models have digital readouts for rapid instrument calibration and single voltage readings if desired.

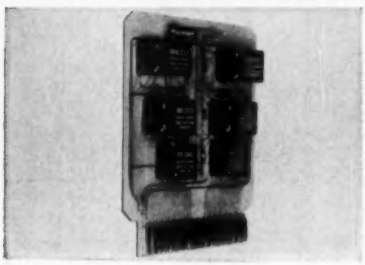
The output leads can be short-circuited without instrument damage. For the ±10-v range, the intrinsic input impedance is 6,250 ohms. Kick-back current from the input circuit is practically nonexistent. Accessory amplifier Model 5100 increases the input impedance to approximately 50 megohms.

PRICE: $6,950.00. **AVAILABILITY:** From Stock. **MFR:** Non-Linear Systems, Inc., Box 728, Del-Mar Airport, Dept EP, Del-Mar, Calif. **SALES OFFICES:** See **eem** p. 1798 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 912, 913

Check **139** *Reader Service Card* 11/61

CIRCUIT CARD ASSEMBLIES [*Harmon-Kardon Inc., Data Systems Div.*]

Each Card Accepts Various Digital Logic Modules



These standard Flexi-Card assemblies are available with customer specified modules.

Each card is specified to perform a logical system function, utilizing an assortment of module types.

General purpose circuit card C-1051 is supplied with power lines preprinted for any six modules (four 1.2" units and two 0.8" units). Provision is also made for four external components.

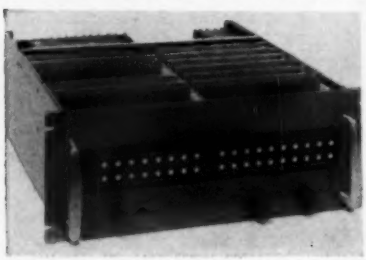
Flip-flop/logic circuit card C-1054 accommodates four modules (of five specific types). The card is completely prewired with all connections available at an output connector. Other cards include: blank type, extender type, drawer, logic, clock and delay and a card frame.

PRICE: $12.50; $3.00 extra for mtg and testing. **AVAILABILITY:** From stock. **MFR:** Harmon-Kardon, Inc., Data Systems Div., Ames Court, Dept EP, Plainview, N. Y. **SALES MGR:** L. J. Torn, OV 1-4000; for nearest rep see **eem** p. 1743 (1961-62 Ed.)

Check **140** *Reader Service Card* 11/61

MAGNETIC CORE MEMORIES [*Electronic Engineering Co., of Calif.*]

Self-Checking Features Provide Automatic Test



For use in data conversion and data processing systems, the EECO 8-level series has a capacity of 128 to 2,048 characters and is available in three different models: random access, sequential access, and sequential interlace. Because of the variation of character capacity and the access, a total of 15 models of memories are offered. All models are constructed on chassis 19" wide by 7" high by 18" deep.

Speed of the series is 200 kc or 5 μsec between load and unload commands.

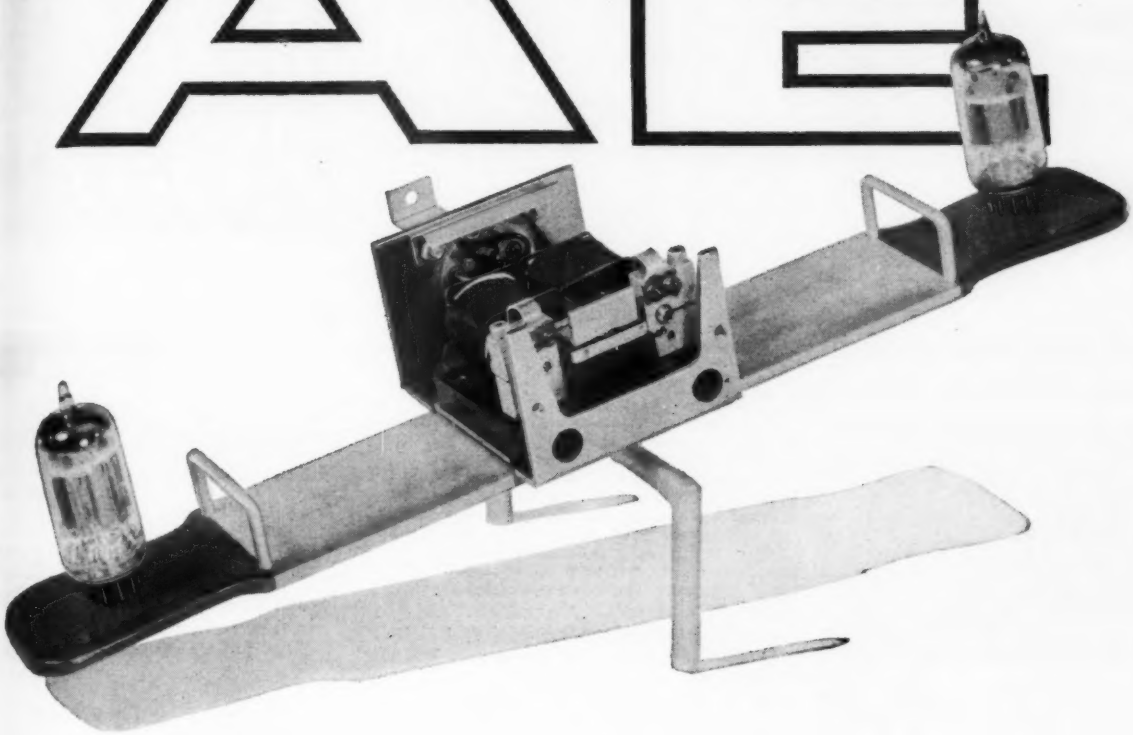
Readout is nondestructive. Front panel indicators display each bit in input register, output register, load address, and unload address.

Power consumption is 120 watts at 50-400 cps, 115 vac. Modular power supplies provide both +12 and −12 vdc.

PRICE: $10,000.00 to $15,000.00. **AVAILABILITY:** 60 to 90 days. **MFR:** Electronic Engineering Co., of Calif., 1601 East Chestnut Ave., Dept EP, Santa Ana, California. **SALES OFFICES:** See **eem** p. 1712 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 673-675, 856

Check **141** *Reader Service Card* 11/61

AE



To the Engineer

looking for a fast circuit seesaw

If you're in need of something better than a flip-flop that only *partially* transfers a circuit —something with a transit time of less than a millisecond—then you'll be delighted with AE's Series PTW Polar Relay. This magnetically biased relay will transfer a circuit with the beautiful regularity of an observatory clock, and trigger on only a few mils from your available energy source.

Substantially smaller than other polar relays, the PTW's unique design virtually guarantees the high-speed switching of a single circuit *billions of times without readjustment!* Its service records to date in telegraph and teleprinter circuits and differential controls suggest that its life is practically limitless. Terminals to meet your specs.

Our circuit engineers will be happy to work with you in adapting the PTW to your designs. Or possibly you'd like to leave the switching to us—in which case we can take on the complete packaging and more than likely shave your costs.

For full information on the PTW, ask for Circular 1821-E – *and* for answers to your control problems, write the Director, Control Equipment Sales, Automatic Electric, Northlake, Illinois.

AUTOMATIC ELECTRIC

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

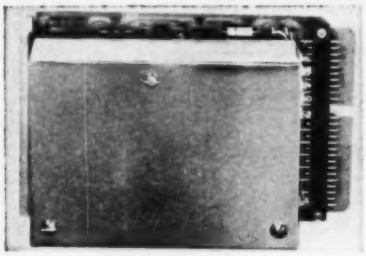
GENERAL SYSTEM

Check **8** *Reader Service Card*

ACOUSTIC SERIAL MEMORY [*Computer Control Co., Inc.*]

eem File System Sec. 2000 electronic engineers master

Compact Unit—Weights Approximately 1 Pound



Digital serial memory SM-40 has pulse delays ranging from 20 μsec to 100 μsec at operating frequencies of 8 to 16 mc in a self-contained plug-in package. It provides storage at data input rates as high as 16 megabits per sec without carrier modulation.

The unit uses a fused silica (glass) acoustic delay line with a temperature coefficient that approaches zero (±2 ppm/°C max), thereby obviating need for temperature control.

This unit consists of a printed circuit board with special input-output logic. Attached to the board, and elevated on standoffs, is a shielded enclosure approximately 4" long by 3" wide by 1" high; the bottom half houses the acoustic delay line; the upper half an associated output amplifier, with fine delay adjustment of 100 μsec.

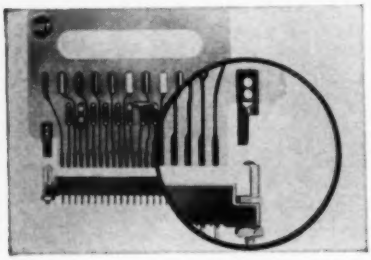
PRICE: $997.00. **AVAILABILITY:** 6 to 8 wks. **MFR:** Computer Control Co., Inc., 983 Concord St., Dept EP, Framingham, Mass. **SALES OFFICES:** See eem p. 1684 (1961-62 Ed.)

Check **142** *Reader Service Card* 11/61

PLUG AND JACK ASSEMBLY [*Ucinite Company*]

eem File System Sec. 2100 electronic engineers master

Polarized Connectors For Printed-Circuit Cards



Positive protection against incorrect insertion of circuit cards is provided by the Dot Polarite plug and jack assembly.

The device consists of a plug, assembled to the circuit board, and a jack, assembled to the edge connector. Discrete combinations are achieved through a patented method of aligning the hexagonal head of the plug so that it can be accepted only by a jack with the corresponding mating angle.

Twelve combinations are afforded by each jack and plug combination so that a pair affords 144 discrete combinations.

Constructed to standard machine-part specifications, they adapt to assembly-line techniques without the use of special tools.

Assemblies are for use with edge connectors manufactured to MIL-C-21097A.

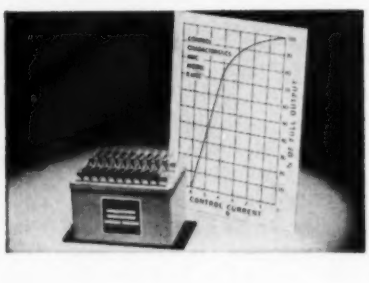
PRICE & AVAILABILITY: Contact Sales Mgr below. **MFR:** Ucinite Co., Electronics Div., Dept EP, Newtonville, Mass. **SALES MGR:** K. G. Bushnell, LA 7-8400; for nearest rep see eem p. 1866 (1961-62 Ed.) **OTHER PRODUCTS:** See eem pp. 720, 770, 1487

Check **143** *Reader Service Card* 11/61

MAGNETIC RECTIFIER CONTROL [*Fairfield Controls, Inc.*]

eem File System Sec. 2200 electronic engineers master

Fires Standard SCR's Over 0°C To 85°C Operating Range



Magnetic rectifier control Model MRC 6203 produces a 3-millisec wide output pulse with an open circuit voltage of 9 volts and a short circuit current of 1 ampere.

A full wave, completely isolated control unit with no common connections between the silicon controlled rectifier load and the control windings, it will fire two rectifiers back-to-back, in a bridge or full wave center tap connection. The unit is designed for use in servo amplifiers, temperature and other power controllers.

A completely separate internal bias supply circuit can be connected to one of the device's five identical 200-turn control windings using a suitable potentiometer in series with the winding.

PRICE: $95.00 (approx.) **AVAILABILITY:** From stock. **MFR:** Fairfield Controls, Inc., 114 Manhattan St., Dept EP, Stamford, Conn. **SALES MGR:** P. Taub, DA 5-1561; for nearest rep see eem p. 1719 (1961-62 Ed.)

Check **144** *Reader Service Card* 11/61

TEMPERATURE MONITOR [*Delta Design, Inc.*]

Limits Temperature Excursions Between Two Pre-Set Values

This unit can be utilized for testing items that would be destroyed if the temperature exceeded or fell below specified limits. When the temperature limit is reached, the chamber in which the devices are being tested is automatically turned off and must be turned on by a manual reset. If a heat generating device is under test and an over heat condition is reached the device being tested can be turned off in a like manner.

As a pyrometer, the monitor indicates the device temperature at a given time.

Initial units are available to control spans as small as 20°F between over-all limits of −100°F and 500°F. Other units are available with over-all spans from −100°F to 1,000°F.

PRICE: $185.00; accessory horn $30.00. **AVAILABILITY:** Contact Sales Mgr below. **MFR:** Delta Design, Inc., 3163 Adams Ave., Dept EP, San Diego, 16, Calif. **SALES MGR:** P. Vasques, AT 3-3193; for nearest rep see eem p. 1695 (1961-62 Ed.)

Check **145** *Reader Service Card* 11/61

FABRICATING MICROMODULES TO MOBILE ROOMS

Magnetic Shields Custom Fabricated to Any Size or Shape

The industry's widest range of production facilities . . . in 3 factories:
PRESS FORMING AND DRAWING • HYDROFORMING • SPINNING • HAND FABRICATION OF PROTOTYPES

Already Tooled for Samples or Production

- Simple designs to elaborate complexes.
- Single or multiple laminae constructions.
- Micromodule size to a completely prefabricated mobile shielded room weighing 5 tons which can be transported anywhere — an achievement unique with Magnetic Shield Division. *

ALSO AVAILABLE

- Processed stock for fabrication in your own plant.
- Co-operative design facilities.

Use this SINGLE CONVENIENT SOURCE for all magnetic shielding requirements. Saves you countless design hours . . . helps speed your project . . . lowers your costs.

We recommend NETIC and CO-NETIC magnetic shielding materials because they are non-shock sensitive, non-retentive, do not require periodic annealing and provide completely effective shielding for optimum results.

NETIC and CO-NETIC are widely specified for satellite, missile, protecting recording tapes, data processing and for innumerable other military, scientific and laboratory applications as well as for commercial applications.

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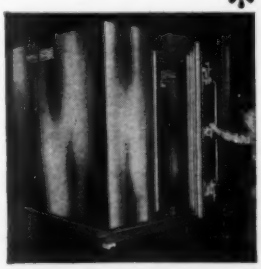
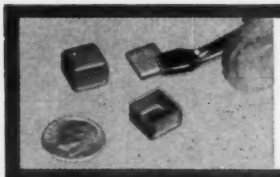
PALO ALTO, CALIFORNIA DAvenport 1-5064
SAN DIEGO, CALIFORNIA ACademy 4-1717
SEATTLE, WASHINGTON EAst 3-8545
PHOENIX, ARIZONA AMhurst 4-4934
HOUSTON, TEXAS HOmestead 5-7780



MAGNETIC SHIELD DIVISION

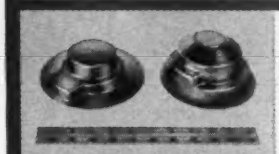
Perfection Mica Company

1322 N. ELSTON AVENUE, CHICAGO 22, ILLINOIS

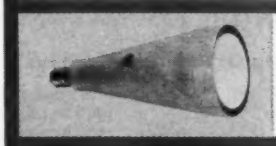


Micro miniature shield and cover, punch press operation.

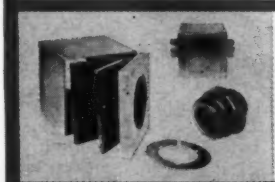
Sequence of shield cans, punch press or spinning.



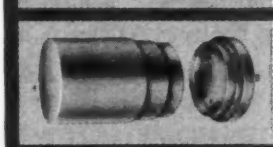
Complex configuration multi-lamina shield, hydroformed.



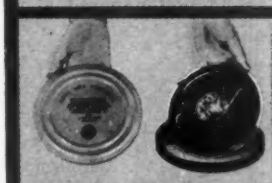
CRT shield illustrating combination of hand fabricaton, spinning and sizing.



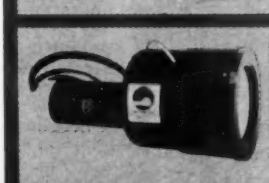
Backward wave tube shield assembly design, involving hand fabrication and hydroform or spinning.



Special purpose shield, hand fabrication (levitated gyro).



Tape preserver can be spun, hydroformed or punch press fabricated.



Data storage tube shield, hydroform or spinning, plus hand fabrication.

Large fabricated special structure (shaker table shield), approx. 60" dia. and 57" high.

Composite photo demonstrating that magnetic shielding qualities of NETIC alloy material are not affected by vibration, shock, (including dropping), etc.

Check **9** *Reader Service Card*

SOLID STATE TIMERS [*Minneapolis-Honeywell Regulator Co., Ordnance Div.*]

eem File System Sec. electronic engineers master 2200

Utilize Controlled Saturation Of A Magnetic Core

Weighing approximately 1 oz (with 12 components) these timers provide time bases ranging from hundredths of a second to 100 seconds with an accuracy of 0.1% over a temperature range of −65°F to 165°F. Shock tests of up to 4,000 g's have had no damaging effect.

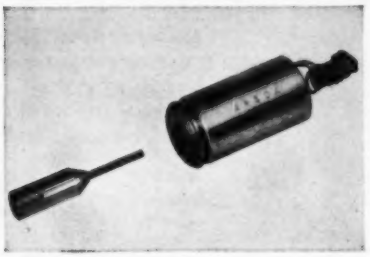
The timers utilize the controlled saturation of a magnetic core (with its ability to integrate a voltage with respect to time) to obtain accurate time periods. Unlimited time intervals can be provided by adding counting circuits. Units have been produced and tested with oscillations of 100 cps and 5, 12, 18 and 50 seconds per cycle. Timers capable of producing time intervals of up to 5 seconds can be packaged in one cubic inch.

PRICE: $150.00 and up. **AVAILABILITY:** 30-60 days. **MFR:** Minneapolis-Honeywell Regulator Co., Ordnance Div., 600 Second St. North, Dept EP, Hopkins, Minn. **SALES MGR:** D. MacLennan, WE 5-5155; for nearest rep see **eem** p. 1787 (1961-61 Ed.)

Check **146** *Reader Service Card* 11/61

PRECISION SOLENOID [*AR&DA (Automation Research & Design Associates)*]

For Accurate Positioning Of Rotating Members



Synchronoid is a precision solenoid packaged in a 1½" diameter by 2⅞" long synchro case which mounts in a 1⅜" diameter pilot hole. It is a push-type solenoid that has a spring force of 3.0 pounds at 0.40" stroke and 7.0 pounds at rest. Its antirotational plunger is restrained to a ±5° maximum rotation.

The pull-in coil draws 2.65 amp and the holding coil draws 0.125 amp at 26 vdc at 78°F.

Weighing 18 oz, the units operate satisfactorily at 10 g's acceleration from −104°F to 161°F at any voltage from 25 to 28 vdc.

Ambient temperature range is from −65°F to 210°F.

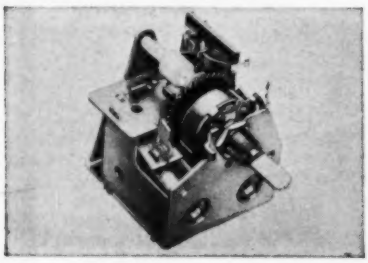
The solenoid is used for accurate positioning of rotating members by acting on a cylindrical cam secured to the rotating member.

PRICE: $74.00. **AVAILABILITY:** 3-4 wks. **MFR:** AR&DA (Automation Research & Design Associates), 135 Main St., Dept EP, Belleville 9, N. J. **SALES MGR:** E. Ward, PL 9-4902

Check **147** *Reader Service Card* 11/61

STEP-DRIVEN POTENTIOMETER/SWITCH [*CTS Corporation*]

Has Fine Control Adjustment



Combined in a single compact unit are a 15/16" diameter variable resistor, an on-off switch, and a two-directional stepping device.

The Series 720's resistor and power switch are controlled by remote or manual operation.

Fine control adjustment is achieved by pulsed input to either of two electromagnets. The control operates clockwise or counterclockwise in 10° increments and advances or retards immediately without going through an entire cycle.

Nominal operating pulse is 25 ma and of 75 millisec duration.

Resistance of each coil is 5,400 ohms. The 3 amp, 125 vac, switch is UL approved.

Applications include remote control of television sets and radios.

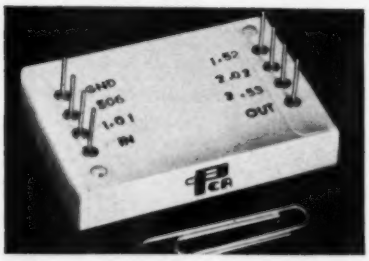
PRICE: Approx. $3.60 ea (prod qty). **AVAILABILITY:** 2 wks (samples); 4 wks (prod qty). **MFR:** CTS Corp., 1142 W. Beardsley Ave., Dept EP, Elkhart, Indiana. **SALES OFFICES:** See **eem** p. 1672 (1961-62 Ed.)

Check **148** *Reader Service Card* 11/61

DELAY LINES [*PCA Electronics, Inc.*]

eem File System Sec. electronic engineers master 2300

Hermetically Sealed—For Printed-Circuit Cards



Case height of the model PCDL delay line is 0.400" maximum; width is 1.400"; length is varied as required. Time delay to rise-time ratios of 5:1 require a delay line length of 1.6". Ratios of 25:1 are obtained in a length of 5.6".

The lines have a 500 vdc rating, maximum attenuation of 0.7 db/μsec for rise time less than 0.15 μsec and 0.35 db/μsec for rise times greater than 0.15 μsec. Tolerances are maintained from −55°C to 125°C.

Up to eight terminals are available on a standard case; more may be added as required. Terminals are 0.030" diameter pins on 0.200" centers. A #6-32 insert on each end of the delay line secures it to the board.

PRICE: $20.00-$150.00 (depending on performance requirements). **AVAILABILITY:** 30 days. **MFR:** PCA Electronics, Inc., 16799 Schoenborn St., Dept EP, Sepulveda, Calif. **SALES MGR:** H. Proppe; for nearest rep see **eem** p. 1803 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 762, 1543

Check **149** *Reader Service Card* 11/61

WHEN THE HEAT'S ON DEPEND ON THESE CTS CERMET RESISTORS

with Space Age 500° C High Stability Metal-Ceramic Element

CTS cermet resistors have exceptionally high stability and reliability . . . tested extensively and proven under extreme environmental conditions . . . achieved by a unique, rugged, hard-surfaced metal-ceramic element processed at over 600°C. Specially adaptable to miniaturization because of high load and heat capabilities in small areas. Wide resistance range.

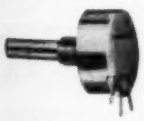
CERADOT

Solid Cermet Fixed Resistors

- 50 ohms thru 100K ohms.
- .050" dia. x .030" L. Other sizes available with or without leads.
- Power rating: 1/10 watt at 125°C.

Kit of 8 different resistance values available at nominal cost.

Request Data Sheet 185 for technical specs or Check 10 Reader Service Card.



CeraTrolS®

Series 400

3 Watt 1¼" dia. Semi-Precision Military Variable Resistor

- Interchangeable with Style RV4 MIL-R-94 but far exceeds temperature and stability requirements.
- Available with 1%, 2% or 3% linearity.
- Power ratings: 3 watts at 85°C, 2 watts at 125°C, derated linearly to zero load at 175°C.

Request Data Sheet 179 for technical specs or Check 11 Reader Service Card.

CERAFER

Modular Fixed Resistors

- 5 to 300,000 ohms resistance per square. Resistance of 10 ohms to 1 megohm available in short straight paths without resorting to lattice or grid patterns.
- Unaffected by solvents, potting compounds or corrosive atmosphere.
- Resistant to nuclear radiation and high vacuum conditions.

Kit of 10 different resistance values—10 wafers with 2 identical resistors per wafer—available at nominal cost.

Request Data Sheet 181 for technical specs or Check 12 Reader Service Card.

CeraTrolS

Series 500

1½ Watt ¾" dia. Semi-Precision Military Variable Resistor

- Interchangeable with Style RV5 MIL-R-94 but far exceeds temperature and stability requirements.
- Available with 1%, 2% or 3% linearity.
- Power ratings: 1½ watts at 85°C, 1 watt at 125°C, derated linearly to zero load at 175°C.

Request Data Sheet 180 for technical specs or Check 13 Reader Service Card.

CERATRIM

Series 170

42-Turn 150°C Square Trimmer Resistor

- Available with wire leads or p.c. pins out bottom or side.
- Power Rating: 1 watt at 50°C derated linearly to zero load at 150°C.

Request Data Sheet 178 for technical specs or Check 14 Reader Service Card.

CeraTrolS

Series 600

¾ Watt ½" dia. Military Variable Resistor

- Interchangeable with Style RV6 MIL-R-94B but far exceeds temperature and stability requirements.
- Power ratings: ¾ watt at 85°C, ½ watt at 125°C, derated linearly to zero load at 175°C.

Request Data Sheet 175 for technical specs or Check 15 Reader Service Card.

CERATRIM

Series 180

25-Turn 200°C Rectangular Trimmer Resistor

- Available with p.c. pins or wire leads.
- Power Rating: 1 watt at 125°C derated linearly to zero load at 200°C.

Request Data Sheet 177 for technical specs or Check 16 Reader Service Card.

Founded 1896

CTS *Corporation*

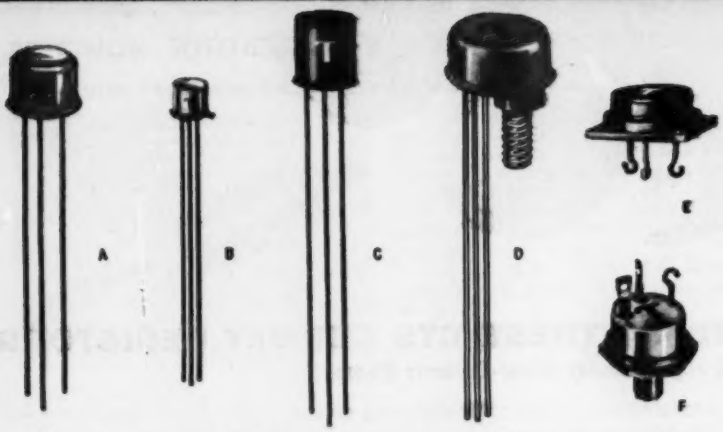
Elkhart, Indiana

Factories in Elkhart & Berne, Indiana; South Pasadena, California; Asheville, North Carolina and Streetsville, Ontario, Canada.

Sales Offices and Representatives conveniently located throughout the world. CTS specialists are willing to help solve your cermet resistor problems.

Transitron SILICON TRANSISTORS

Get off-the-she eliv neares ist

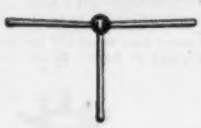


Transitron has broadened its line of silicon transistors, offering added types to meet a variety of applications. You can count on getting these particular types, competitively priced, at your nearest authorized Transitron distributor **now!** Call him today!

SMALL SIGNAL (Grown Junction)		
Type	**Beta Range**	**Package**
2N332	9-20 @ 1 mA	A
2N333	18-41 @ 1 mA	A
2N334	18-90 @ 1 mA	A
2N335	37-90 @ 1 mA	A
2N336	78-330 @ 1 mA	A
2N337	20-55 @ 10 mA	A
2N338	45-150 @ 10 mA	A
SMALL SIGNAL (Mesa)		
*2N734	20-50 @ 5 mA	B
*2N735	40-100 @ 5 mA	B
*2N736	80-200 @ 5 mA	B
*2N738	20-50 @ 5 mA	B
*2N739	40-100 @ 5 mA	B
*2N740	80-200 @ 5 mA	B
*2N1564	20-50 @ 5 mA	A
*2N1565	40-100 @ 5 mA	A
*2N1566	80-200 @ 5 mA	A
*2N1572	20-50 @ 5 mA	A
*2N1573	40-100 @ 5 mA	A
*2N1574	80-200 @ 5 mA	A
MEDIUM POWER		
2N339	9-90 @ 5 mA	C
2N340	9-90 @ 5 mA	C
2N341	9-90 @ 5 mA	C
2N342	9-32 @ 5 mA	C
2N343	29-90 @ 5 mA	C
2N497	12-36 @ 200 mA	A
2N498	12-36 @ 200 mA	A

NEW MICRO-TRANSISTOR DEVELOPMENTS!

Aware of the constant need for greater miniaturization Transitron has introduced a new line of micro-transistors.



Transitron Micro-t— the first Silicon diffused Mesa Micro-Transistor in an all glass package!

AMPLIFIER TYPES*	SWITCHING TYPES*
TMT 839	TMT 842
TMT 840	TMT 843
TMT 841	

*For those with even smaller sized requirements these transistors are also available in a micro-epoxy package.

(Epoxy packages prefixed with TEMT symbol)

Further information on all these types can be obtained by writing to Transitron Electronic Corporation, Wakefield, Massachusetts. Inquiries for micro-logic, low level and PNP transistors are also invited.

Transitron

"Leadership in Semiconductors"

he elivery from your res istributor

MEDIUM POWER (Cont'd.)		
Type	Beta Range	Package
2N656	30-90 @ 200 mA	A
2N657	30-90 @ 200 mA	A
*2N696	20-60 @ 150 mA	A
*2N697	40-120 @ 150 mA	A
2N698	20-60 @ 150 mA	A
2N699	40-120 @ 150 mA	A
2N1131	15-45 @ 150 mA	A
2N1132	30-90 @ 150 mA	A
*2N1420	100-300 @ 150 mA	A
INTERMEDIATE POWER		
*2N1047	12-36 @ 500 mA	D
*2N1048	12-36 @ 500 mA	D
*2N1049	30-90 @ 500 mA	D
*2N1050	30-90 @ 500 mA	D
POWER		
2N389	12-60 @ 1A	E
2N424	12-60 @ 1A	E
*2N1722	20-90 @ 2A	E
*2N1724	20-90 @ 2A	F

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COMPANY _____

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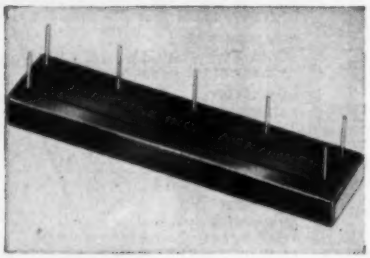
CITY _____ STATE _____

MILLIMICROSECOND DELAY LINES [*Bel Fuse Inc.*]

eem File System Sec. 2300

Configurations For Numerous Printed Board Layouts



For use with high-speed pulse circuitry, Nanalines are available with time delays of 5 to 100 nsec.

Units are epoxy potted and suitable for printed board mounting.

Some models are tapped for circuit trimming. Model 100T95 is tapped at 95 nsec, Model 100T90 is tapped at 85 nsec, Model 100T85 is tapped at 85 nsec, and Model 100TM is tapped at 85, 90, and 95 nsec; all have time delays of 100 nsec. Rise time for a 100-nsec delay line is 9 nsec.

A 10-nsec unit has a 100 mc bandwidth.

These units lend flexibility of design to digital computer circuits, pulse generatory and circuitry, and fast oscilloscopes.

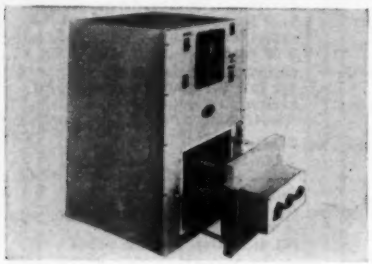
PRICE: $4.50 to $10.00 (sm qty); $1.80 to $4.00 (prod qty). **AVAILABILITY:** Stock to 2 wks. **MFR:** Bel Fuse Inc., 198 Van Vorst St., Dept EP, Jersey City, N. J. **SALES MGR:** Mrs. G. Frankel, HE 2-0403; for nearest rep see **eem** p. 1661 (1961-62 Ed.)

Check **150** *Reader Service Card* 11/61

HIGH AND LOW TEMPERATURE TEST CHAMBER [*Gruenberg Electric Co., Inc.*]

eem File System Sec. 2600

Rack Or Cabinet Mounting Unit Has Over 1,000 Cubic Inch Test Volume



Operating from −100° F to 600° F, the Hi-Low environmental test chamber uses liquid CO_2 as a coolant. Removable flanges are included with each chamber for mounting in a standard 19″ rack panel.

Close temperature control is accomplished by an indicating thermostat in conjunction with a forced horizontal air circulating system. Chambers have two inch insulation, silicone door seals, and are complete with CO_2 connecting hose.

The front door, which is hung on pins and easily removed, can be replaced by a component test module. These modules are wired with Teflon leads terminating in a decade switch box. Modules are available for 100 diodes, resistors, and transistors.

Heating and cooling are said to be rapid enough for shock testing.

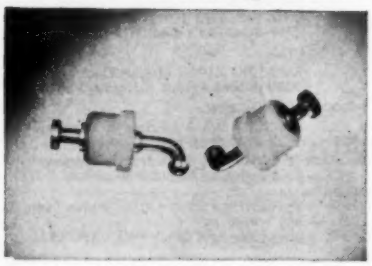
PRICE: $600.00 and up. **AVAILABILITY:** 3 to 4 wks. **MFR:** Gruenberg Electric Co., Inc., 9 Commercial Ave., Dept EP, Garden City L. I., N. Y. **SALES MGR:** D. R. Imwalle, PI 1-4180; for nearest rep see **eem** p. 1739 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 776

Check **151** *Reader Service Card* 11/61

SUBMINIATURE REVERSE FEEDTHRU [*Sealectro Corp.*]

eem File System Sec. 2800

Provides 90° Turn Through Chassis



Type RFT-SM-18 TUR-L2 subminiature reverse feedthru provides a terminal feed through the chassis with a termination suited for an alligator test clip placed in a vertical position from the chassis, or where wiring configurations are such that the 90° turn permits a straight (axial) run from the terminal.

Overall height of the feedthru is 0.378″; body diameter is 0.148″. The metal stud, terminated in turrets on both ends, is made of brass, measuring 0.040″ in diameter, and is finished in either solder or gold-plate. The Teflon body is available in any standard EIA color.

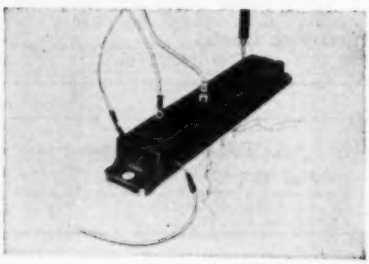
Installation is by press-fit technique—the terminal is merely pressed through a properly prepared hole in the chassis.

PRICE: Contact Sales Mgr below. **AVAILABILITY:** 2 wks. **MFR:** Sealectro Corp., 139 Hoyt St., Dept EP, Mamaroneck, N. Y. **SALES MGR:** G. E. Mohr, OW 8-5600; for nearest rep see **eem** p. 1835 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 816, 817

Check **152** *Reader Service Card* 11/61

TERMINAL BLOCK [*Modular Electronics*]

Capacity 50 Amp Per MIL-T-16784-A



Accepting all common lead terminations — spade, ring or fork lug, test probe, straight pin and wire wrap — Uni-Block features top and side entry, with feed-thru pins (optional).

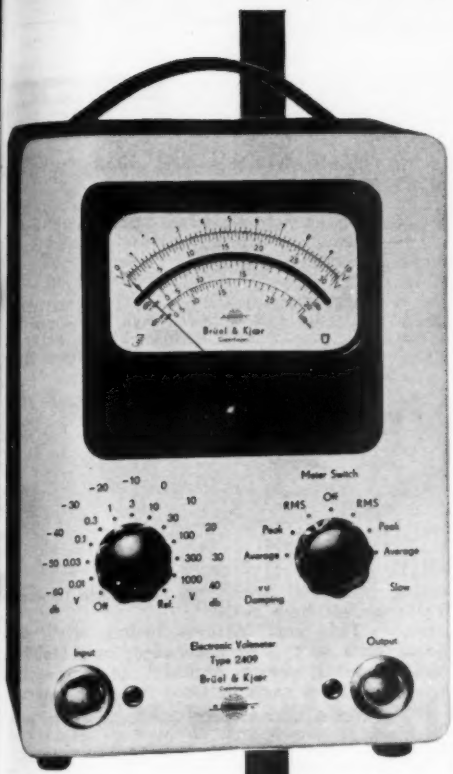
Insertion of terminal lug is all that is required. Lug snaps into place providing a secure electrical and mechanical connection with a withdrawal force of 35 to 40 lb. Tension can be varied by screw adjustment.

Blocks are available in five and 10 position models, with up to four terminations per position. Units can be placed end-to-end or side-by-side providing any number of terminations in a small area.

Circuits can be rapidly assembled without tools, and probes can be temporarily inserted for testing.

PRICE: $1.95 to $3.00 ea (5-pos) gold-plated contacts $0.50 add.; $2.75 to $4.25 ea (10-pos) gold-plated contacts $1.00 add. **AVAILABILITY:** Stock to 2 wks. **MFR:** Modular Electronics, 6211 S. Labree Ave., Dept EP, Los Angeles 56, Calif. **SALES MGR:** B. J. Lamont, AX 5-3377

Check **153** *Reader Service Card* 11/61



- **RMS, AVERAGE AND PEAK DETECTION**
- **COMPLETE OVERLOAD PROTECTION**
- **±0.2 db, 2 TO 200,000 c/s**

NEW
MODEL 2409

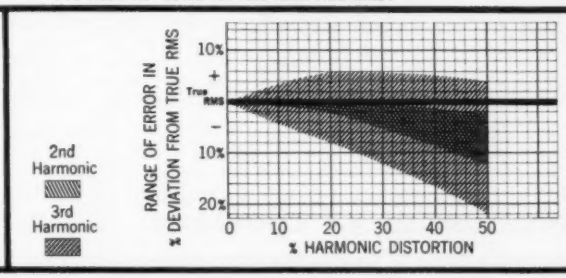
TRUE RMS ACCURACY NOW UNIVERSALLY PRACTICAL

The most important single quantity to express the magnitude of any AC signal is its RMS value. To assure positive accuracy for the measurement of all wave forms, you must really measure the RMS value.

On an average responding voltmeter, the RMS values indicated for rather complex signals may be as much as 20% to 100% low.

You need not settle for less than true RMS!

This graph indicates the range of deviation from True RMS to be expected for the measurement of distorted AC signals by Average Responding Voltmeters.



The ruggedness, reliability and price advantages of the Model 2409 break through all 'roadblocks' to realizing the full advantages of DIRECT MEASUREMENT READINGS OF TRUE RMS values as your company-standard-practice.

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Write today for the new '2409 Brochure' and explore the major benefits to your company of universal RMS voltage measurements.

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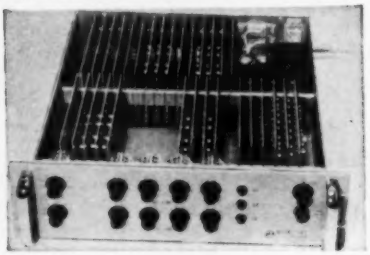
Check **17** *Reader Service Card*

DIGITAL COMPARATORS [*Non-Linear Systems, Inc.*]

eem File System Svc
electronic engineers master 2900

Operate Within Preset Limits Of Either Polarity On Any Range



Fully transistorized and equipped with mercury-wetted contact relays, the NLS 54 and 55 digital comparators determine if an input voltage or series of voltages are within present limits.

On Model 54, a four-digit instrument, ranges of ±1, ±10, ±100, ±1,000, −1, −10, −100 and −1,000 are provided to permit comparing bipolar numerical data from 0.0001 to 999.9.

Designed for comparing bipolar data from 0.0001 to 999.99, Model 55 is a five-digit instrument. Both comparators can operate within preset limits of either polarity and on any range.

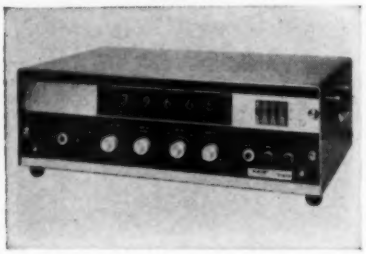
Both units convert data from digital measuring instruments such as a-c digital voltmeters, digital ratiometers and digital ohmmeters into go/no-go form.

PRICE: $2,000.00 to $2,900.00. **AVAILABILITY:** Contact Sales Offices below. **MFR:** Non-Linear Systems, Inc., Dept EP, Del Mar, Calif. **SALES OFFICES:** See **eem** p. 1798 (1961-62 Ed.). **OTHER PRODUCTS:** See **eem** pp. 912, 913

Check **154** *Reader Service Card* 11/61

FREQUENCY COUNTER [*Erie-Pacific*]

Accuracy ±0.001%, ±1 Count



Frequency counter and preset translator Model 740 offers direct conversion from frequency to physical units. The instrument provides rapid readout of unknown quantities by translating pulses-per-unit-time into physical units-per-unit time.

Specifications include: 0 - 220,000 pps, 1-220,000 cps frequency range; ±0.001% ±1 count accuracy; 50 mv rms, 10 cps to 100 kc and 200 mv rms, 1 cps to 220 kc input sensitivity; 0.1, 1.0 and 10 millisec, 0.1, 1.0 and 10 sec normal time bases; 0.1 millisec to 1 sec in 0.1 millisec increment and 1 millisec to 10 sec in 1 millisec increment preset time bases.

This unit features in-line Nixie readouts in 4, 5 or 6 decades; oven-stabilized crystal; preset, digital time base applicable as a variable time interval generator.

PRICE & AVAILABILITY: Contact Sales Mgr below. **MFR:** Erie-Pacific, Div. of Erie Resistor Corp., 12932 So. Weber Way, Dept EP, Hawthorne, Calif. **SALES MGR:** E. C. Titcomb; for nearest rep see **eem** p. 1716 (1961-62 Ed.). **OTHER PRODUCTS:** See **eem** p. 860

Check **155** *Reader Service Card* 11/61

HIGH-FREQUENCY TRANSFER VOLTMETER [*Ballantine Laboratories, Inc.*]

Voltage Range 1 To 50 Volts—Frequency Range 25 CPS To 30 Mc

Designed to measure a-c voltages from 1 v to 50 v at frequencies from 25 cps to 30 mc, model 393 h-f transfer voltmeter determines an a-c voltage by equating its heating effect to that of an accurately measurable d-c voltage.

A laboratory standard instrument for calibration of r-f voltmeters, signal generators, and for frequency response measurements, it consists of a transfer unit and a set of five probes each capable of use over a 2 to 1 range of a-c voltages.

Frequency response accuracy of the probes is 0.1%, 25 cps to 10 mc, and 0.5%, 10 to 30 mc.

Nominal thermocouple current is 5 ma. Maximum safe thermocouple current is 7.5 ma. Nominal open circuit output emf for a 5 ma heater is 7 mv.

PRICE: $950.00 (including five probes). **AVAILABILITY:** Contact Sales Mgr below. **MFR:** Ballantine Labs., Inc., Dept EP, Boonton, N. J. **SALES MGR:** F. Zayac, DE 4-1432; for nearest rep see **eem** p. 1659 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 831

Check **156** *Reader Service Card* 11/61

TRANSISTORIZED A-C CONVERTER [*Electro Instruments, Inc.*]

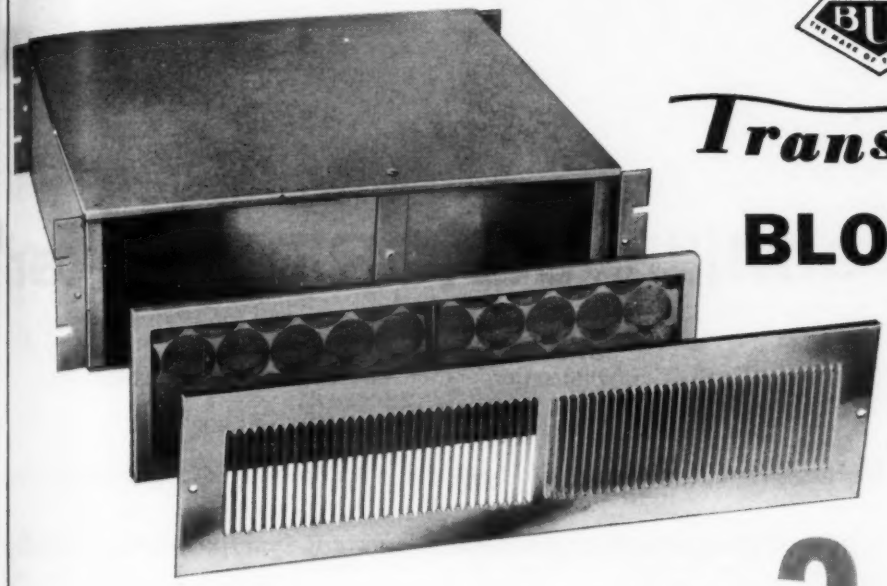
A-C Accuracy ±0.1% Of Reading Or 2 Digits

Eltronic 882 is a full five-digit, totally transistorized a-c/d-c voltmeter/ratiometer. All switching is accomplished by semiconductor devices, thereby eliminating mechanical contact maintenance. The a-c converter develops a d-c output voltage proportional to the average value of the a-c input signal. The d-c output voltage is applied to the d-c instrument for display and automatic placement of the decimal point location on a 3-position tilting readout. Provisions are made for directly driving a digital printer.

The d-c accuracy is ±0.01% of the reading or 1 digit. The d-c ratio range is ±0.0001 to ±999.99; a-c voltage range is 0.0001 to ±0999.9; d-c voltage range is ±0.0001 to ±999.99; a-c frequency range is 30 to 10,000 cps.

PRICE: $1,250.00. **AVAILABILITY:** 60 days. **MFR:** Electro Instruments, Inc., 8611 Balboa Ave., Dept EP, San Diego 11, Calif. **SALES MGR;** R. Flemons, BR 7-6590; for nearest rep see **eem** p. 1709 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 848, 849

Check **157** *Reader Service Card* 11/61



Trans-aire BLOWERS

Now available in 3 sizes

Two years of user acclaim of the B-25 fostered the development of two additional sizes. The Trans-aire Blowers are now available in three sizes with panel spaces of 3½", 5¼" and 7". Air displacement from 100 cfm to 750 cfm results.

Heat generated by tubes and semiconductors not only shortens their life-span, impairs their efficiency but also may cause operational breakdowns. Why take chances with delicate and expensive equipment; install Bud Trains-aire Blowers.

Bud Trans-aire Blowers are ideal for use where excessive heat is generated by equipment in an enclosed rack, cabinet or console. They draw in fresh air or exhaust heated air.

To prevent overheating they have thermal overload protection. Automatic reset.

These blowers occupy less area, and a smaller panel space than others having similar air displacement capability. They are the lowest priced units of equal capacity and performance.

See the Bud Trans-aire Blowers at your Authorized Bud Distributor or write for informative descriptive literature.

BUD RADIO, INC.
CLEVELAND 3, OHIO

FEATURE
Sec. 5700

Milliwatt CRT Heater

By B. M. Soltoff and C. H. Tyson
Philco Corporation, Lansdale Division, Lansdale, Pa.

Miniaturized heater-cathode operates on 250 mw and supplies 1-ma in most current military and entertainment-type pickup and display

While low power requirements of transistorized video-communications equipment have made battery-operation practical, pickup and/or display tube heater power requirements remain a significant portion of the total power consumption. To meet this need cathode-ray-tube heaters have been developed that operate on a fraction of the previously required heater power.

One approach has been to miniaturize the heater-cathode assembly, while using the same basic materials and maintaining the same parts configuration and electrical operating characteristics of conventional pickup and display cathode-ray-tubes. As a result, only 250 mw is required to operate the heater.

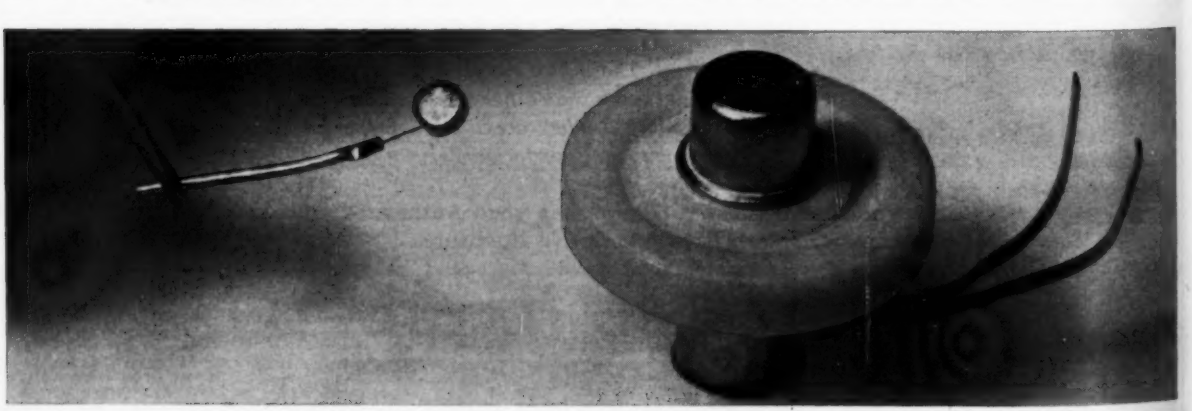
Construction

Figure 1 shows the heater and cathode construction. The entire unit is jig assembled and spaced assuring accurate control of tube operating parameters such as cut-off voltage and zero-bias beam current.

Within the 50-mil outside diameter and 18-mil long nickel cathode cup is a reversed coiled heater, 32 mil in diameter and 10-mil thick. The heater has a standard alundum coating applied prior to assembly with the cathode. After insertion of the heater, the cathode is filled with additional insulation to impart extra strength to the heater body, assure electrical isolation from the cathode and improve heater-to-cathode heat transfer. The heater is held in the cathode cup by a nickel ribbon, which lays flat against the back of the heater and is welded to the cathode cup.

A tungsten cathode-lead wire attached to the rim of the cathode cup forms, together with the heater leads, a tripod mounting for the heater-cathode assembly. This mounting provides a minimum of heat loss by conduction from the cathode. A 2-mil layer of regular carbonate emission material is then applied to the cathode surface.

Figure 2 illustrates the low-heater-power assembly, which has an overall size of 138-mil diameter by 165-mil



Miniature cathode-ray-tube heater-cathode assembly on end of tweezer-held wire requires only 250-mw of heater power, but duplicates electrical operating characteristics of conventional-size heater-cathode at right.

for Space Applications

beam current with 4-sec warm-up time. Assembly can be incorporated

cathode-ray tubes — including storage, radar, coder, readout types.

length, attached behind the control grid. The grid is mounted to the cathode assembly by passing the tripod through a disc of cement, the perimeter of which attaches to the lower skirt of the control-grid cup. Any desired electron gun design can be attached forward of the control grid.

Electrical Characteristics

Nominal heater rating is 2.4 v at 105 ma and nominal cathode temperature is 750°C. A curve of cathode activity as a function of heater power is shown in Figure 3; in the operating region, the emission is space-charge limited — not temperature limited allowing stabilized operating characteristics with varying heater voltages.

Beam current of 1 ma and maximum ratings of 450 v peak heater-cathode voltage during warm-up and 200 volts after warm-up are the same as the ratings for conventional-size crt heater cathodes.

A cathode warm-up time of 4 seconds from a cold start, a highly desirable feature in transistorized equipment, is a result of the excellent heat transfer from heater to cathode, which is mostly by conduction rather than by radiation. The more intimate contact between heater and cathode in this form of construction also improves heater life as the heater operates at a lower temperature than in conventional tubes.

Power Sources for Heater-Cathode

When designing low heater power cathode-ray-tubes into transistorized equipment, problems often arise regarding suitable power sources.

Higher voltage heater designs require greater lengths of high-resistivity wire that would not fit into the small cathode cup. On lower-voltage designs, resistance of connecting leads to the heater become a significant part of the total resistance causing a loss of some of the total heating effect on the heater-cathode assembly.

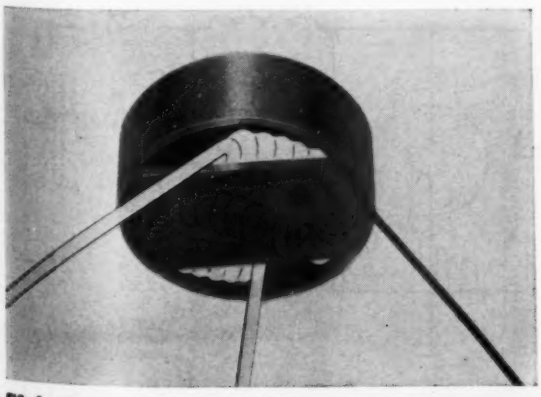


FIG. 1 — Reversed coil heater is held in place in 50-mil diameter and 18-mil long nickel cathode cup by nickel ribbon.

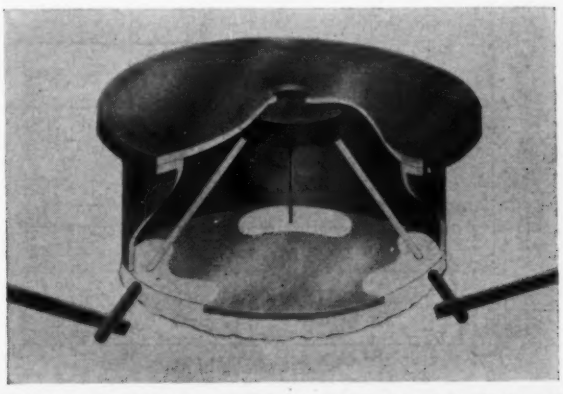
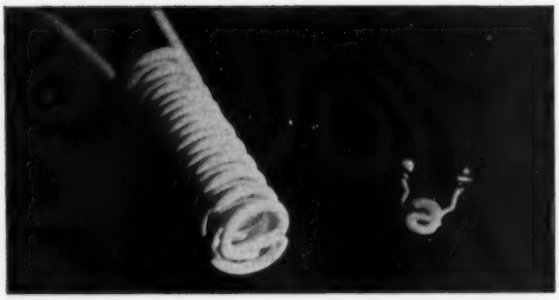


FIG. 2 — Heater-cathode assembly is attached to control grid through a cement disc on the lower edge of the grid assembly.



Miniature crt heater at right is S-shaped coil with alundum insulating coating. Conventional-size heater is at left.

Low-power heater-cahode-grid assembly (left) can be mounted on almost all cathode-ray tube electron guns.

In entertainment receivers, for example, there are several alternative crt heater power source techniques that are also directly applicable to military requirements. Generally almost any circuit branch having a suitable current drain can be utilized by placing the heater in series with the branch. However, consideration must be given to fusing requirements, current variations due to normal or abnormal circuit operation and matching of the circuit current requirements to the cathode-ray tube heater current requirements. Some possible locations are the vertical output stage, the horizontal output stage, the power supply section and the horizontal-output-transformer core.

Output-Stage Supplies

The circuit diagram of a typical transistorized vertical output stage is shown in Figure 4. Since the vertical output transistor is shunt fed, the heater is placed in series with choke L_1. As the vertical output draws slightly more current than the heater requires, R_1 is used as a shunt and C_1 bypasses the vertical-signal component.

When the vertical drive signal is removed the heater current may increase by 20 percent. Overload protection can be provided with a zener diode placed across the heater. The diode voltage rating should be higher than the heater rating to not conduct until the normal operating range is exceeded. A series fuse would cover the possibility of the output transistor shorting. A reduction in availaable vertical sweep, due to the drop across the heater, can be corrected by reducing the decoupling choke resistance or by using an initially higher supply voltage.

It is not as advisable to operate the heater from a horizontal deflection section — in series with the horizontal oscillator and output stages. The heater voltage drop, along with a suitable shunt, will adversely affect the sweep and necessitate a greater supply voltage to insure normal operation.

Because of the large current pulses drawn by the horizontal sweep section, it is difficult to adequately

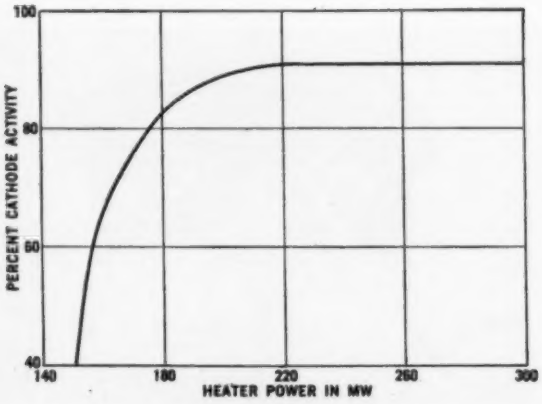


FIG. 3 — Space-charge limited emission of miniature crt heater assures stable operating characteristics.

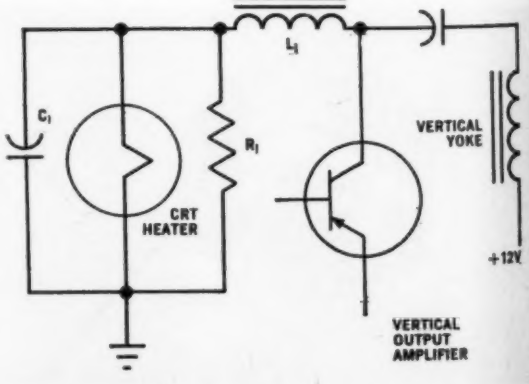


FIG. 4 — Transistorized vertical output stage can be utilized as possible power source for heater.

bypass the crt heater, resulting in additional sweep degeneration. Circuit protection similar to that used for the vertical sweep source is required.

Power Supply Section

Using the power supply as the power source, the crt heater may be placed in series with the total battery drain or in parallel with the battery, using a dropping resistor. The latter connection is wasteful of power and partially negates one advantage of the low-power heater; however, there is little likelihood of damage to the cathode-ray tube in the event of failure of some other component.

The series connection requires a shunting resistor and heavy bypassing. The power waste in the shunting resistor depends on the total current drain on the power supply.

A further possibility in the power supply section is to employ a tapped battery, or two separate batteries. If a rechargeable battery is used however, this method presents difficulty in maintaining equal charge on all cells.

Horizontal-Output Transformer Core

The horizontal flyback pulse can be utilized as the heater power source, in the same manner that is presently used for receiver high-voltage rectifier tube filaments.

The flyback winding represents a constant voltage source. Small adjustments in the heater voltage can be made by inserting a series resistor or by employing resistance wire in the winding. Additional loading due to the heater winding has negligible effect on the operation of the horizontal output stage.

Figure 5 shows the voltage waveform appearing across a crt heater when it is operated from a flyback winding. The peak-to-peak pulse amplitude will vary slightly depending upon the retrace time of the circuit.

The easiest way to determine the heater winding specifications is to use a thermomilliammeter in series with a resistor chosen so the resistor and the meter combination simulate the nominal heater impedance.

In one experimental setup with a entertainment receiver, a 5-percent increase occurred in heater current with the horizontal oscillator out of sync in one direction; in the other direction, a decrease of 5-percent was noted due to the change in the pulse duty cycle. In Figure 6, variation of the power supplied to the heater and cathode activity are shown as functions of battery voltage. The latter curve indicates that operation is in the space-charge limited region as battery voltage is varied from 9 to 12.5 volts.

A number of tests were made to determine if the pulsed nature of this supply would cause premature heater failure. Samples were subjected to 30-minute pulse amplitudes increasing in 5-volt steps until failure occurred.

Burn-out failures occurred when the pulse amplitude reached three times its normal level. The failures were not immediate, but occurred after 10 to 15 minutes of operation at this elevated level. The average current at the point of burn-out was about twice the normal current, with a d-c source, failure again occurred at about twice normal current — indicating the burn-out was caused by the average heating effect, rather than the peak pulse amplitude. Therefore, with this type of source, there is little likelihood of exceeding the rating of the heater sufficiently to cause damage or burn-out.

The final choice of power source must be made by considering the available supply voltages in a particular equipment and evaluating the advantages and disadvantages of each source. However, for most applications the horizontal output transformer core appears to be the most versatile and satisfactory solution.

AVAILABILITY: Low-power heater-cathode incorporated in most picture, flying-spot-scanner, radar, vidicon and other special-purpose c-r tubes — minimum four weeks. **PRICE:** Above types — dependent on quantity; 19BUP4 (19" crt with low-power heater) — $21.00 from stock. **MFR:** Tube Operations, Philco Corp., Lansdale Div., Church Rd., Dept EP, Lansdale, Pa.

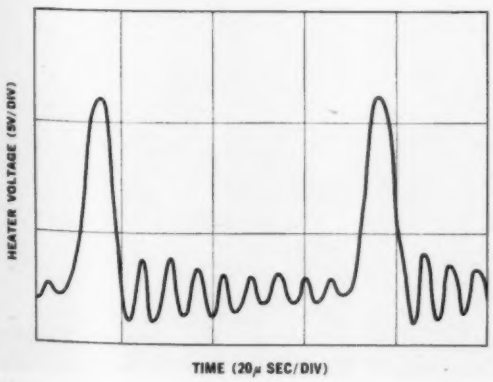


FIG. 5 — Typical waveform across heater when operated from horizontal-output transformer flyback winding.

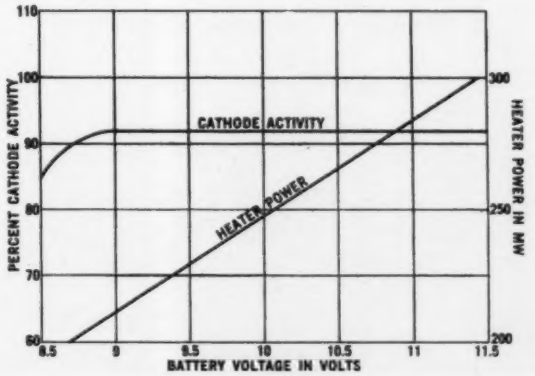


FIG. 6 — Heater operates in space-charged region of characteristic over 9-v to 12.5-v battery-voltage range.

FEATURE
Sec. 4800

Miniature Power Transistor Eliminates Heat Sink

by **Jerrold A. Krasny**, Manager, Applications Engineering,
Silicon Transistor Corporation, Carle Place, New York

Silicon power unit in TO-5 case without heat sink operationally replaces conventional silicon power transistor with 6 by 5 by 3/32-inch heat sink in identical free-air conditions. Miniature single-diffused junction mesa device has 0.3-ohm max saturation resistance at 1.0 amp and 25°C.

Operational temperatures of silicon power transistor junctions have conventionally been maintained at non-destructive levels (below 200°C) by mounting the units on large dissipation-area convoluted heat sinks. However, for power operation in a saturation condition, improving the heat sinks side-steps the basic problem—reduction of the saturation resistance to a level where the transistor case becomes primarily an anticontaminant device and not a major element of a heat exchanger.

Development of a miniature single-diffused junction mesa transistor which combines all the electrical characteristics of a superior silicon power device with the extremely low saturation resistance expected of a ger-

Uncapped 2N2034 shows silicon wafer mounted on modified TO-5 header. Spring-pressure soldered clips between lead posts and wafer provide high-current low-resistance surface contact.

manium device, makes available a silicon power transistor, the 2N2034, in a TO-5 case that is operationally superior to many transistors requiring 360 times larger dissipating surfaces.

As illustrated in Figure 1, the saturation resistance of a typical high-usage silicon power transistor such as the 2N424 is 10 ohms maximum for I_C = 1.0 amp at 25°C and 12 ohms at 100°C ambient temperature. Mounted on a 6 by 5 by 3/32-inch aluminum-plate heat sink having one side exposed to free air, the square-package 2N424 has a rated junction-to-case thermal resistance ϕ_{JC} of 2.08°C/w and a plate-to-ambient thermal resistance ϕ_{PA} of 3.6°C/w. An additional 0.4°C/w is developed by thermal resistance ϕ_{CP} between the transistor case and the aluminum plate.

In comparison, the 2N2034 has a saturation resistance of 0.3 ohm max at 25°C and 0.36 ohm at 100°C ambient temperature for I_C = 1.0 amp. Without a heat sink, it has a junction-to-ambient thermal resistance ϕ_{JA} of 167°C/w maximum.

Using the relationship junction temperature $T_J = (P_{dissipated})\ (\phi_{JA}) + T_{ambient}$ at I_C = 1 amp and 100°C, T_J(2N424) = (12)(2.08 + 3.6 + 0.4) + 100 = 173°C and T_J(2N2034) = (0.36)(167) + 100 = 165°C. Thus the 2N2034, operating at the same current and ambient temperature conditions as the 2N424, has a lower junction temperature and inherently higher reliability without a heat sink than its monolithic counterpart with a heat sink.

Because of the low saturation resistance, the 2N2034 can be operated at much lower quiescent collector voltages — without impairing the amplitude excursion — thereby reducing the d-c power dissipation inside the package. Further, in class AB operation, the lower saturation resistance and resultant voltage permits greater signal amplitude excursions before saturation clipping occurs.

Regarding validity of using the maximum saturation resistance rating when an R_{CS} value of 50 percent less than the maximum is typical, transistor manufacturers specify given maximum ratings because meaningful yields occur at these values, or variations in production lots may result in substantial future yields at the maximum values. Design engineers, aware of this variation occurrance, can design for the worst possible case guaranteed by the manufacturer.

General Electrical Characteristics

Other electrical characteristics of this miniature power transistor are similar to many other power transistors and in some aspects superior; for example, collector currents are equal to or greater than 3 amp, cutoff and open-base avalanche voltages are equal to or greater than 80 and 60 v respectively, d-c gain is 20 to 60 at 1 amp, collector leakage current is equal to or less than 25 μa at 80 v, emitter-to-base breakdown voltage is equal to or greater than 6 v at 25 μa, alpha cutoff is typically 2.5 mc and the junction temperature range is −65°C to 200°C.

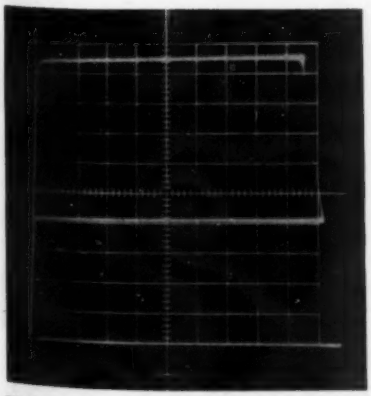
Although the 2N2034 is in a TO-5 case, it should not be confused with intermediate power transistors such as the 2N497, 2N498, 2N656, or 2N657, which have maximum saturation resistances of 25 ohms at 200 ma and maximum collector currents of 500 ma.

Gain-temperature characteristics are displayed in Figure 2A and Figure 2B illustrates the variation of d-c gain with respect to collector current.

Production Method

Low saturation resistance is obtained through a single-diffused junction mesa process that produces a larger effective junction area and larger base-emitter periphery than usually found in mesa transistors packaged in this size case.

Both sides of a *p*-type silicon slice are coated with phosphorus and a wax pattern is placed on one side of the slice. The unwaxed phosphorus portion of the patterned side is etched away to expose the *p*-type silicon. The wafer is then placed in a diffusion oven and the phosphorus on both sides of the silicon is simultaneously



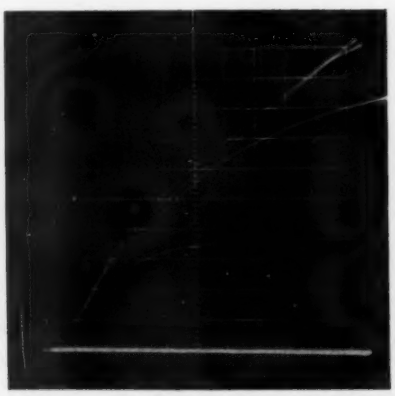


FIG. 1 — Traces indicate saturation resistance of TO-5 size 2N2034 (left) and conventional-size 2N424 (right) power transistors for 20-ma variations of I_B. Ordinates are collector current, 100 ma/division and abcissas are collector voltage, 1 v/division.

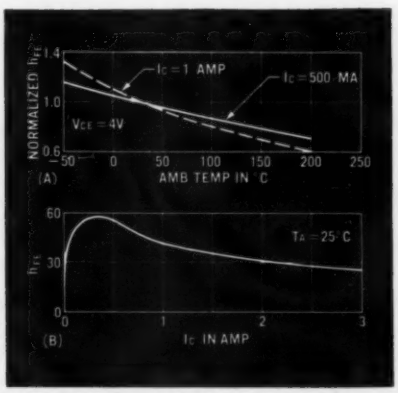


FIG. 2 — Direct-current gain variation characteristics of 2N2034 power transistor as functions of collector current and temperature.

diffused into the base material to a separation of less than 0.0005 inch at approximately 1,250°C.

The unetched phosphorus diffused side of the silicon is the collector region, the etched *p*-type silicon is the base and the patterned region becomes a mesa emitter.

An asset of this process is the extremely parallel base-emitter and collector-base junctions obtained, allowing uniform current distribution around the junction periphery as illustrated in Figure 3.

Special TO-5 Case Design

A silicon power wafer with low saturation dissipation was only a partial solution to the miniaturization problem. The objective was to reduce the size of this transistor to fit a TO-5 package. However, most standard TO-5 cases have glass bases and are rated at 125 mw at 25°C ambient. The power pellet dissipating 0.3 w therefore precluded this standard package. Thermal resistance studies resulted in the development of a thick metal-based TO-5 case with power dissipation capabilities exceeding 1 w at 25°C ambient.

Mating of the silicon transistor wafer and the TO-5 case produced an unusual result. Although the wafer saturation resistance is 0.3 ohm max, the resistance of the 1½ inch leads of the TO-5 case is approximately 0.13 ohm at 1 amp — a 40-percent increase in apparent saturation resistance at this rated current level. The transistor however is designed for mounting on printed-circuit boards where the leads will make contact with the eyelets or plated thru holes within ⅜ inch from the transistor base.

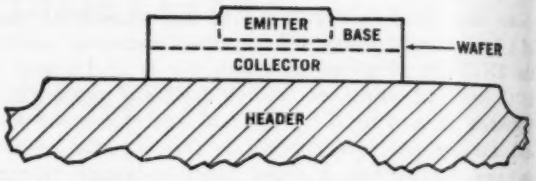
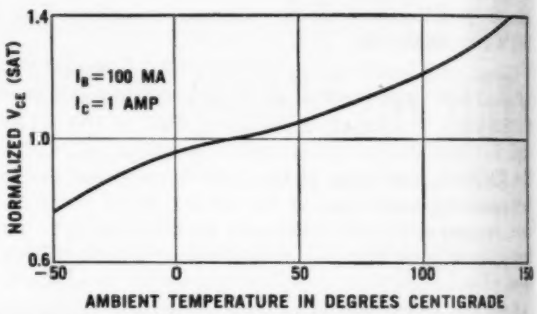
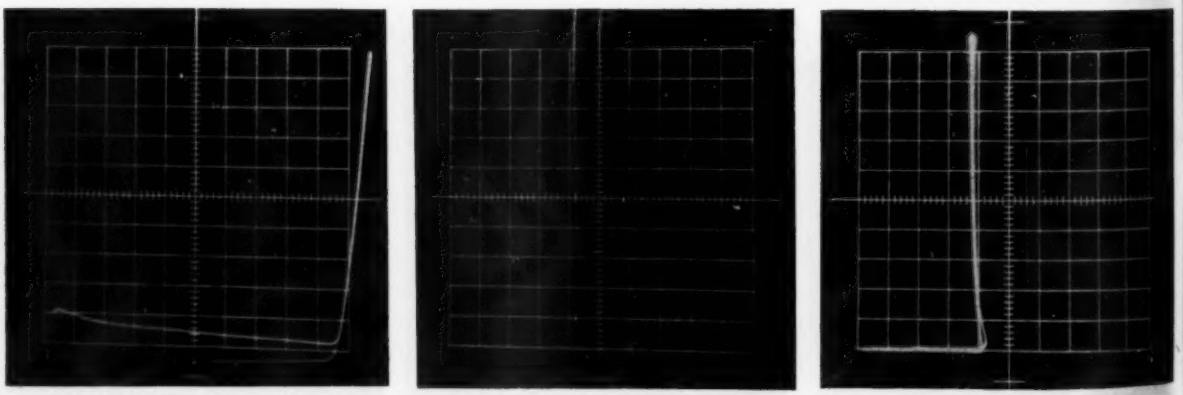


FIG. 3 — Cross section of 2N2034 transistor shows parallel base-emitter and collector-base junctions obtained by single-diffusion technique. Collector region is unetched phosphorus diffused side of silicon wafer; base is etched *p*-type silicon.



Normalized saturation resistance characteristic of 2N2034 transistor.

PRICE: $23.40 (1-99), $15.50 (100-999). **AVAILABILITY:** From stock. **MFR:** Silicon Transistor Corp., 150 Glen Cove Rd., Dept EP, Carle Place, L. I., N. Y. **SALES MGR:** H. Kaepplein; for nearest rep see **eem** p. 1839 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1409.



Traces for 2N2034 represent typical V_{CES}, base shorted, characteristic approaching breakdown (left) and avalanche modes of V_{CES} (center) and V_{CEO}, open-circuited, (right). Horizontal scales are 10 volts/division (left) and 20 volts/division (center and right); vertical scales are 10 microamperes/division (left) and 5 milliamperes/division (center and right).

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6,000 G Mil Test Spec

Solitron's thermoset rectifier in use at -196° C where glass and top hat versions failed!

Rugged, long lasting, completely reliable, highest performance characteristics under extreme conditions — all these describe the new Solitron hermetically-sealed, double-diffused silicon rectifier. Called the HC and CER Series, these new units are available from 30 volts PIV up to 1,200 volts — and up to 1.1 amps in a thermoset package!

These transfer molded units have already passed 6,000 G Mil-Spec tests for reliability and are rated as exceeding MIL-std E-1084 and MIL-std 202 method 103A humidity test. Operates at −196°C---- where glass and top hat versions have failed. **Priced competitively.**

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Units offered in metal housings and in a recent Dearborn development of economical polyester-wrap, resin-filled fabrication, offering extremely low inductance characteristics previously restricted to metal housings.

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Dearborn ELECTRONIC LABORATORIES INC.
P. O. Box 3431 • Orlando, Florida • TErrace 8-5400

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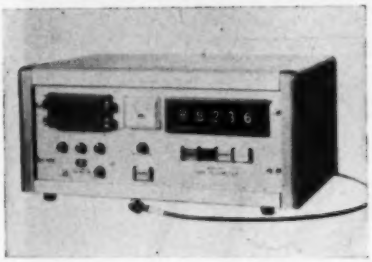
HIGH ACCURACY FLUXMETER [*J. C. Carter Co.*]

eem File System 5cc. electronic engineers master 2900

Features Digital Readout And Remote Control Provision



Model 611 fluxometer measures fields to an accuracy of 1 part in 10^5 with an external electronic counter. Accuracy is 0.1% from the dial indication. The unit can also be used as a field control unit to regulate a magnetic field.

Four probes are available: 500-1,200, 1,000-3,000, 2,000-13,000, and 12,000-30,000 gauss. Probes are 9/16" thick x 1" diameter and have a BNC cable connector. The nuclear magnetic resonance (NMR) fluxmeter signal is presented on a 3" rectangular oscilloscope. Dial position is read out digitally on the front panel.

Pushbuttons control the tuning, on-off, and change of range. Probes have interlock contacts so that there is no doubt regarding which probe is in use. The device weighs 49 pounds; cabinet size is 9.5" x 21.5" x 15".

PRICE: $1,800.00. **AVAILABILITY:** 90 days. **MFR:** J. C. Carter Co., 671 W. 17 Street, Dept EP, Costa Mesa, Calif. **SALES MGR:** W. Saxton, LI 8-3421

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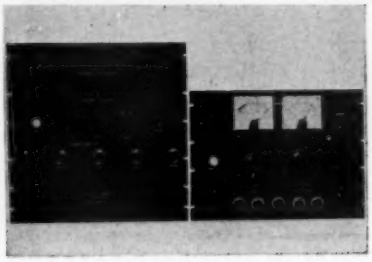
AUTOMATIC CAPACITOR TESTER [*Associated Research, Inc.*]

Tests Up To 50 Capacitors—Automatic Alarm, Failure Memory



This automatic capacitor test set sequentially measures leakage current in as many as 50 capacitors and provides a record of failures.

Model 8515 automatic capacitor tester fixture (left) is equipped with panel lights to indicate the unit under test. In addition, a memory light signals the failure of a unit, and remains illuminated while the automatic test sequence continues.

Model 8514 automatic hypot (right) supplies a d-c potential continuously adjustable from 0 to 20 kv for capacitor testing. A monitorized control raises the test potential to any preset value, and then returns to zero. The leakage current measurement ranges are 0-10 and 0-250 μa.

PRICE: Model 8514 with model 8515: $7,500.00. **AVAILABILITY:** 90-120 days. **MFR:** Associated Research, Inc., 3777 W. Belmont Ave., Dept EP, Chicago 18, Ill. **SALES MGR:** R. Inman, CO 7-4040; for nearest rep see **eem** p. 1653 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 829

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POWER LINE MONITOR [*Radio Corporation of America, Electron Tube Div.*]

Accuracy of ±2% At 120 V And ±3% At 100 V And 140 V

Power line monitor WV-120 is used where it is important to know the power-line voltage at all times.

It can be used on 120 vac power-line sources with frequencies of 25, 50, 60, or 400 cps. The meter has an expanded scale. Also, the tip of the meter pointer is wide enough to be seen clearly at a considerable distance from the instrument.

Meter movement is a moving vane type which indicates rms values even when the waveform of the power supply voltage is distorted.

This slightly damped movement allows the meter to reveal the presence of line-voltage bounce or fluctuations.

PRICE: $14.95. **AVAILABILITY:** From stock: **MFR:** Radio Corporation of America, Electron Tube Div., 10th and Federal Sts., Dept EP, Camden 2, N. J. **SALES MGR:** J. Meagher, WO 3-8000; for nearest rep see **eem** p. 1820 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1579

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LATCH-IN FAULT INDICATOR [*Minneapolis-Honeywell Regulator Co.*]

Permanent Indication Of Circuit Operation—Even Of Short Pulses

Three-quarter inch diameter sealed miniature magnetic latch-in fault indicator HCM-¾ is available in various current and voltage ranges. The front panel face is 0.875" x 0.875"; the unit is 1.59" long maximum over-all. Weighing 1.3 oz, the operating temperature range is −55°C to 85°C.

A disc type flag rotates behind a sector window. When unenergized, the flag is magnetically held in the off position. When energized, it rotates to the on position and is held there magnetically even if the energizing power signal is removed.

Return to the normal off position is accomplished by reversing the polarity of the energizing source. The device maintains a positive indication even when unenergized under vibration from 10 to 500 cycles at 10 g's.

PRICE: Contact Sales Offices below. **AVAILABILITY:** 30-90 days. **MFR:** Minneapolis-Honeywell Regulator Co., Precision Meter Div., Grenier Field, Dept EP, Manchester, N. H. **SALES OFFICES:** See **eem** p. 1787 (1961-62 Ed.)

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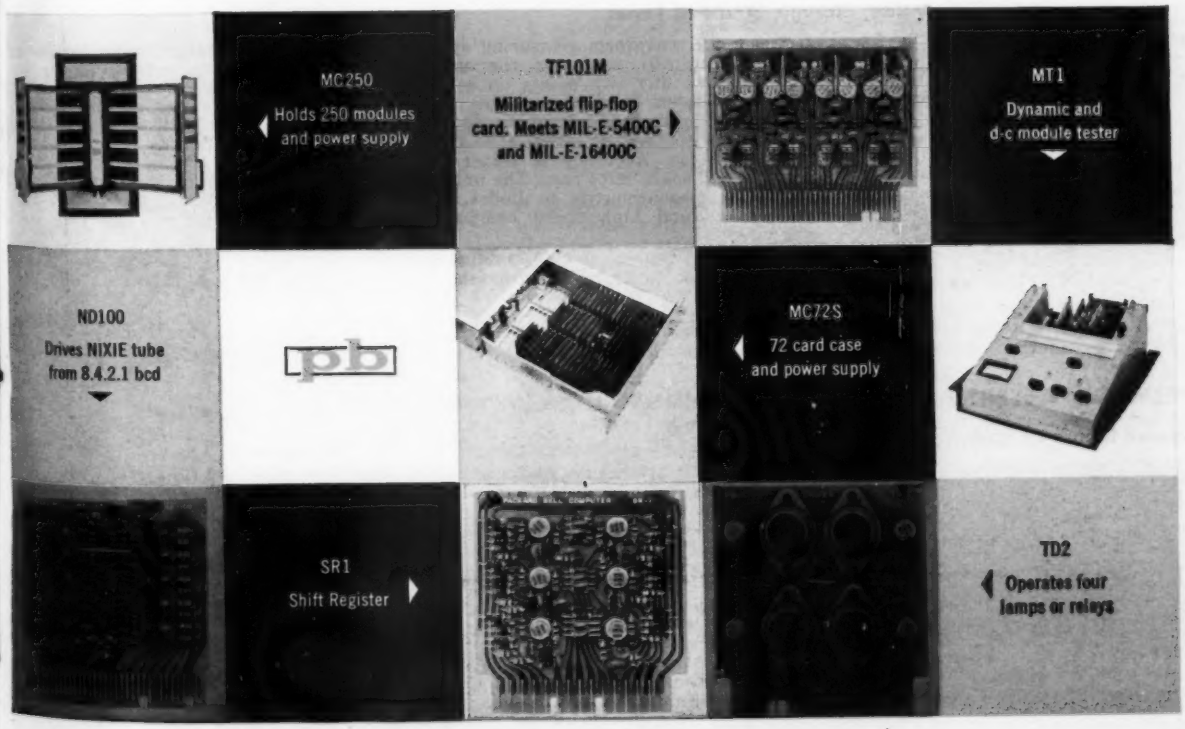

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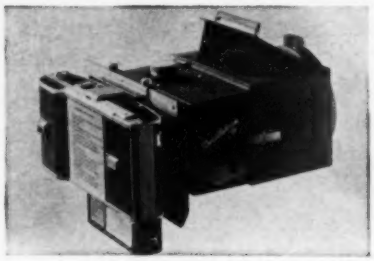
OSCILLOSCOPE CAMERA [*Beattie-Coleman, Inc.*]

eem File System Sec. 2900 electronic engineers master

Completely Self-Contained Changeable-Ratio System



Mark II Oscillotron permits the operator to select any object-to-image ratio from 1:1 through 1:0.5 with the 75 mm f/1.9 lens supplied. No additional parts or extra lenses are required.

Fitting any 5" oscilloscope, the camera provides: external rack-and-pinion focusing; direct viewing port; electric shutter; shutter open indicator light; rotating back for vertical or horizontal pictures; Polaroid dark slide.

When used in the vertical format position, as many as 13 multiple exposures can be made on one film without image deterioration or distortion.

Either the roll film or 4x5 cut film adapters can be obtained with an integral data recording chamber.

PRICE: $625.00 ($95.00 extra for data chamber). **AVAILABILITY:** From stock **MFR:** Beattie-Coleman, Inc., 1000 N. Olive St., Dept EP, Anaheim, Calif. **SALES MGR:** J. Wilcox, PR 4-4503; for nearest rep see **eem** p. 1660 (1961-62 Ed.)

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MICRO-MICROAMMETERS [*Radiation Technology, Inc.*]

Twenty Ranges, From 3 x 10^{-3} To 1 x 10^{-12} Amp

Model R660 micro-microammeter has a drift of less than ±2% of full scale per week, after initial warm-up. The d-c meter can be used to measure current from ionization chambers and phototubes in radiation field determinations, reactor control, radiation monitoring systems and thickness gauging.

The meter uses a hybrid circuit with an electrometer tube input and solid state circuitry thereafter. A 5886 electrometer tube indicates null at the input. Current is fed back through a high resistance to keep the input voltage near ground potential, reducing input impedance and drift.

Input can be either positive or negative, as selected by a front-panel switch. The 4½" mirror scale meter has an accuracy of ±2% on the 3 x 10^{-3} to 1 x 10^{-8} ampere range.

Suitable output signals are provided to drive a 1-ma recorder.

PRICE: $495.00. **AVAILABILITY:** 4 wks. **MFR:** Radiation Technology, Inc, 657 Antone St, N. W., Dept EP, Atlanta 18, Georgia. **SALES MGR:** W. R. Champion, 404-873-2632

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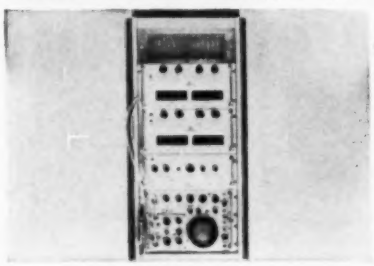
AUTOMATIC WAVEFORM MEASURING SYSTEM [*Dymec Div. of Hewlett-Packard Co.*]

Measures Transistor Delay, Rise, Storage, And Fall Times



Automatic waveform measuring system DY-5844 digitally measures the elapsed time between any two points on a high-speed waveform. It measures time intervals between any two points chosen from the 0 to 100% level of either stimulus or response pulse. Accuracy is better than ±4% of full scale, ±0.4 nsec. The unit will also make measurements on diodes, magnetic cores and high speed components and circuits.

Features included in the system are: dual inputs to measure stimulus and response pulses simultaneously; oscilloscope monitoring of both simultaneously; selected parameter measured in 0.25 sec.

Measured information can be presented on standard digital display or external recording devices.

PRICE: $8,000.00 to $12,000.00. **AVAILABILITY:** 10 to 16 wks. **MFR:** Dymec Div., Hewlett-Packard Co, 395 Page Mill Rd., Dept EP, Palo Alto, Calif. **SALES MGR:** W. Dallenback, DA 6-1755; for nearest rep see **eem** p. 1702 (1961-62 Ed.)

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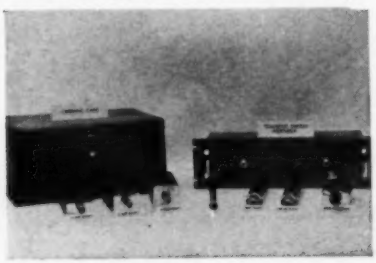
PRIMARY ALTERNATING CURRENT SHUNTS [*Holt Instrument Labs.*]

Overall Range Of 5 Ma To 26 Amp



Providing a frequency response which extends their use beyond the audio range, these alternating-current primary shunts, Model HCS-1, are coaxial four-terminal resistors.

The accuracy of ac-dc difference in these modules for frequencies above 5 cps and below 50 kc, including dc, is provided to 0.02%. The shunts are used on a direct 1 to 1 current basis.

Since no ratio calculation is used, the absolute resistance of the shunt does not affect the accuracy of the measurement. Equipped with uhf type connectors, these shunts have an overall range of 5 ma to 26 amp.

Applications include use where high accuracies are desired over a broad frequency range.

PRICE: $700.00. **AVAILABILITY:** 45 days. **MFR:** Holt Instrument Labs., Dept EP, Oconto, Wis. **SALES MGR:** R. C. Ronzie, Octonto 163; for nearest rep see **eem** p. 1748 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 883

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- **POWER CORD SETS** (with molded male plug): 18″ retracted length.
- **COMMUNICATIONS CORDS** (shielded & unshielded): 2′ & 4′ retracted lengths.
- **TEST LEAD WIRE:** 12″ retracted length.
- **OTHER SIZES** to order.

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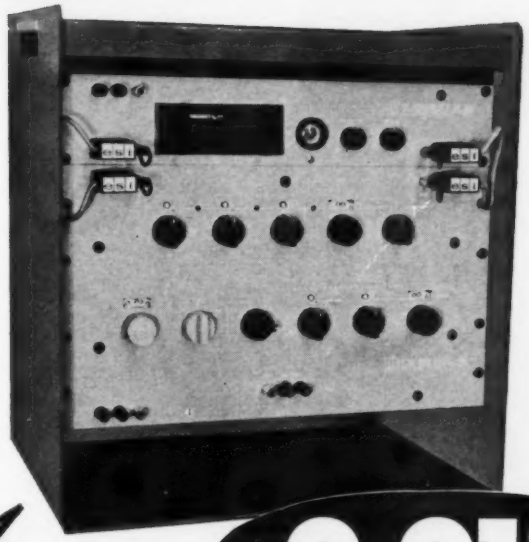
in the **esi** System Concept

MODEL 700 CAPACITANCE MEASURING SYSTEM···



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Calibration of fixed value capacitance standards.

Measurements of voltage, frequency and temperature effects on all types of capacitors.

Measurements of very low value three-terminal capacitors without zero correction.

• Measures two or three-terminal capacitors in the range from 0 to 0.12 microfarads with a resolution of 0.0001 picofarads on the lowest range. Use of a ratio transformer circuit and a specially designed standard air capacitor having a very low temperature coefficient of capacitance and an exceptionally high stability minimizes drift due to changes of room temperature, voltage and frequency. Accuracy of the measured capacitance is referred to this one standard which can be periodically checked and adjusted to agree with an NBS certified standard for traceability.

• The complete, matched system includes the new ESI 707 capacitance bridge and the new ESI 860-B generator-detector, a combination of an ac generator and a sensitive null detector designed especially for use as an accessory to the bridge. Write for catalog sheet C-28.

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HARMONIC MEASUREMENT EQUIPMENT [*Electromagnetic Technology Corporation*]

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Harmonic Amplitude Measurement Accuracy ±3 Db

Harmonic measurement set HMS-L1 measures amplitudes of harmonic and spurious signals in waveguide outputs of high-power transmitters. It comprises a waveguide mode-sampling section, r-f probe, power indicator-calibration unit, and necessary interconnecting cables and adaptors.

To measure power level of a particular harmonic, the probe is inserted successively into the probe holes in the waveguide section, and the power level at each point is read on the indicator unit. These readings are then averaged to obtain the amplitude of the particular harmonic.

Fundamental frequency range is 755 to 985 mc and harmonic frequency range is 1,500 to 3,000 mc. Minimum detectable signal is 1 mw.

Units are available in L, S, and C Bands.

PRICE: Contact Sales Mgr below. **AVAILABILITY:** 60 days. **MFR:** Electromagnetic Technology Corp., 1375 California Ave., Dept EP, Palo Alto, Calif. **SALES MGR:** P. O. Engelder, DA 1-8611

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SQUARE-WAVE POWER SOURCE [*International Electronic Research Corp., Elin Div.*]

250 Nsec Rise And Fall Times

Power source SQP-106T provides a square-wave output of 6 va, with rise time less than 250 nsec and symmetry within 500 nsec when driven by an external sine-wave signal or from a built-in signal source.

Output voltage is variable from 0 to 60 volts peak-to-peak, with regulation of 0.5% no-load to full-load and 0.1% half to full-load.

Units are fixed frequency within a range of 50 cps to 20 kc.

The units meet reliability requirements of missile check-out stands for gyros, synchros and similar devices.

A 100-va future model will accept 50-cps to 50-kc sine-wave signals.

PRICE: $495.00. **AVAILABILITY:** 4 wks. **MFR:** International Electronic Research Corp., Elin Div., 135 West Magnolia Blvd., Dept EP, Burbank, Calif. **SALES MGR:** J. Markley, Jr., VI 9-2481; for nearest rep see **eem** p. 1714 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 859

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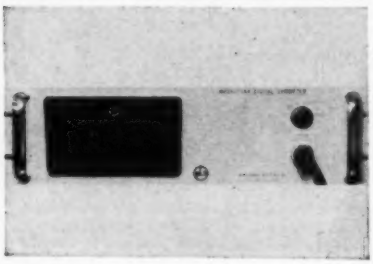
DIGITAL OHMMETER [*Non-Linear Systems, Inc.*]

With Built-In Controls For Automatic Operation Of Data Printers



Automatic range changing and positioning of the decimal point are two major features of the Model 784 digital ohmmeter. For ease of troubleshooting and servicing the unit includes plug-in stepping switches, decade resistors mounted on plug-in circuit boards and a snap-out readout to permit changing lamps in less than one minute.

The device measures at an average rate of 1 reading per second with an accuracy of ±0.05% of the reading plus 1 digit. All range changing from 10 megohms to 0.1 ohm, in ranges of 9999/999.9/99.99/9.999/0.9999 kilohms, is done automatically.

Applications include research and development work, inspection, quality control, and environmental testing. Dimensions are: 5.25″ high, 19″ wide, and 15.25″ deep.

PRICE: $1,650.00. **AVAILABILITY:** Contact Sales Offices below. **MFR:** Non-Linear Systems, Inc., Del Mar, Calif. **SALES OFFICES:** See **eem** p. 1798 (1961-62 Ed.). **OTHER PRODUCTS:** See **eem** pp. 912, 913

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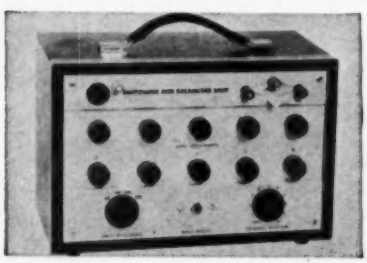
SWITCHING AND BALANCING UNIT [*Baldwin-Lima-Hamilton Corp.*]

Ten Channel Device Permits Fast Switching Of Gages To Indicator



Switching and balancing unit, Type 525, is useful when readings must be taken on each of a group of gages.

The 10-channel instrument affords individual gage bridge balancing; provision for full and half-bridge configurations; selectivity for gage resistances of 60 to 500 ohms on full bridge and 60 to 2,000 ohms on half bridge. Measurements can be made during the same test with both two and four-arm bridges.

The unit has a balancing range of ±7,000 μin./in. Repeatability is better than 1 μin./in. after a half-million channel selector switch rotations. Switching resistance is negligible.

Gages can be connected to the instrument panel in active-dummy pairs, groups of actives with a common dummy, or any desired combination including the three-wire lead system.

PRICE: $395.00. **AVAILABILITY:** From stock. **MFR:** Baldwin-Lima-Hamilton Corp. Electronics & Instrumentation Div. 42 Fourth Av. Dept EP, Waltham 54, Mass.

Check **173** *Reader Service Card* 11/61

OSCILLATORS OFF THE SHELF . . .

far lower cost, too!

Delta f *transistorized*

tuning fork oscillators

FROM

$45.00 to $99.50

EACH

pricing based on oscillator frequency and quantity of your order

A new concept in oscillator production . . . designed to meet your schedules. *Immediate delivery if your tuning fork oscillator requirements fall into these specifications:*

FREQUENCY: Any specified frequency in range of 50 cps to 4 kc.
TEMPERATURE RANGE: 0° C to +60° C.
FREQUENCY TOLERANCE: ±0.15% over temperature range.
FREQUENCY ACCURACY: ±0.05% at nominal room temperature.
SUPPLY VOLTAGE: 26 ± 3 volts.
OUTPUT: Sine, 3 Volts RMS, < 10% distortion. Square, 12 V PP minimum, < 10 MSEC rise time.
LOAD IMPEDANCE: 10 K Nominal

24-hour delivery for "other frequency" oscillators

Delta F specializes in oscillators . . . oscillators of every type, every requirement. In addition to the "off the shelf" DFO-80 series, Delta F also designs and manufactures the most complete line of transistorized tuning fork and crystal oscillators available.

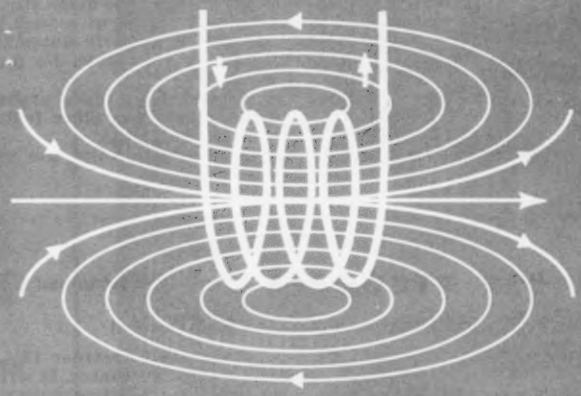
Write or phone your "off-the-shelf" order

Delta f INC.

113 State Street • Geneva, Illinois
Phone: CE 2-7600

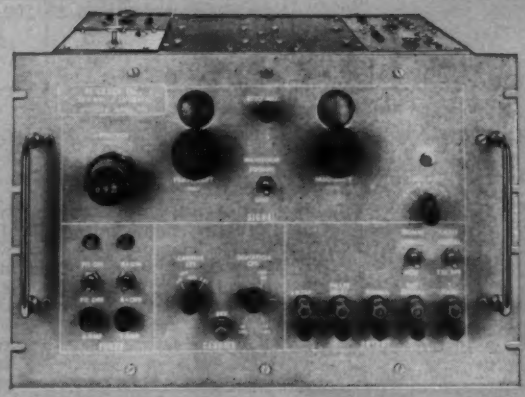
Check **36** *Reader Service Card*

FOR ACCURATE* CHECK OUT OF SERVO SYSTEMS...



REMANCO

SERVODYNE†
SERVO ANALYZER



*So Accurate, Servodyne exceeds its own tight specifications

Repeatability . . . Servodyne excels. It's all electronic — no mechanical devices. Rugged — and simple to maintain.

Wherever servo-mechanisms are used — in flight control, flight table, automated machinery, and other servo applications — Remanco's Servodyne Servo Analyzer provides a reliable means for system checkout. In practice, accuracy exceeds rigid factory standards prescribed for the unit. Featuring modular design for easy maintenance, the Servo Analyzer is rugged, simple to operate . . . For complete test and evaluation of AC servo systems . . . For frequency phase, and transient response tests of DC servos. Frequency ranges from .001 to 100 cps; sine or square wave outputs, entire range. Other servo analyzers designed and built to customers' specifications are available.

† Trade Mark

REMANCO *INCORPORATED*

1805 COLORADO / SANTA MONICA, CALIFORNIA

Check **37** *Reader Service Card*

AUTOMATIC VACUUM-TUBE VOLTMETER [*B & K Manufacturing Co.*]

eem File System Sec. 2900

Individual Scale For Each Direct-Reading Range

Reading difficulty and chance of error are minimized in the Dynamatic 375 automatic vacuum-tube voltmeter. The instrument has an individual wide-view scale for each range, each the same size. Since only one scale is visible at a time, setting the range switch properly automatically provides the correct scale. No multiplication is necessary.

A single d-c/a-c ohms probe, and anti-parallax mirror are other features. Accuracy is 3% full-scale.

Ranges for d-c volts, a-c volts (rms), and a-c volts (peak-to-peak) are 0-1.5, 5, 15, 50, 150, 500 and 1,500; d-c current ranges are 0-5 ma, 50 ma, 500 ma. Ohms ranges are 0-500 ohms, 5K, 500K, 5 meg, 50 meg, 1,000 meg. Input resistance is 11 meg on all d-c ranges. Size is 10¾" x 6¾" x 4" and weight is 8 lb.

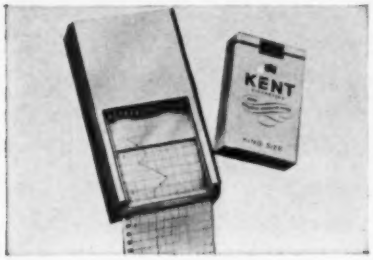
PRICE: $89.95. **AVAILABILITY:** Stock. **MFR:** B & K Mfg. Co., 1801 W. Belle Plaine Ave., Dept EP, Chicago, Ill. For nearest rep see eem p. 1654 (1961-62 Ed.)

Check **174** *Reader Service Card 11/61*

MINIATURE RECORDER [*Amprobe Instrument Corp.*]

eem File System Sec. 3000

Inkless Units In Several Ranges Of Voltage And Current



This miniature recorder (3 1/16" x 5 5/8" x 1 11/16") weighs 20 ounces. It writes on 2½" wide pressure sensitive paper moving at a speed of 15" per hour. The paper is said to be unaffected by heat, cold, moisture, humidity or fumes.

Units are available in the following standard ranges of voltage and current: recording voltmeter, 0/150/300/600 vac and (with suppressed-zero circuitry for increased sensitivity) 0/95/130/ vac and 0/190/260 vac; milliammeter, 0/1/50 mvac; ammeter, 0/5/25/100/250 amp and 0/20/100/400/1,000 amp (two snap around transducers are used); d-c milliammeter, 0/1 milliamp; d-c microammeter, 0/50 μa.

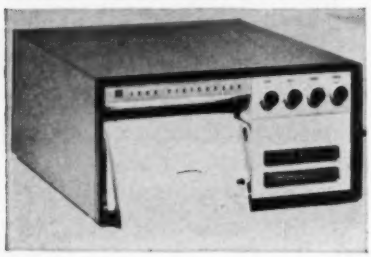
Also available are wattmeter and temperature-recorder versions, scaled to correspond to appropriate acessories.

PRICE: $69.85. **AVAILABILITY:** 10 days. **MFR:** Amprobe Instrument Corporation, 630 Merrick Rd., Dept EP, Lynbrook, L.I., N.Y. **SALES MGR:** M. Schwartz, LY 3-5600; for nearest rep see eem p. 1818 (1961-62 Ed.)

Check **175** *Reader Service Card 11/61*

DIRECT-RECORDING OSCILLOGRAPH [*Minneapolis-Honeywell Regulator Co.*]

Weight Approximately 50 Pounds



Model 1508 Visicorder fits 24 direct-recording channels into 7" of rack height; the 24 channels are recorded on 8-inch-wide paper, with each channel capable of recording individual static or dynamic phenomena at frequencies from dc to 5,000 cps.

All operating controls are on the front panel of the instrument, and any of 12 recording speeds can be selected before or during recording by push button controls.

Peak-to-peak deflection of 8 inches, is possible and traces are recorded at writing speeds in excess of 50,000 inches per second.

Time and grid lines are spaced on the record paper in logical patterns, while trace identification interruptions occur each 8 inches of record travel.

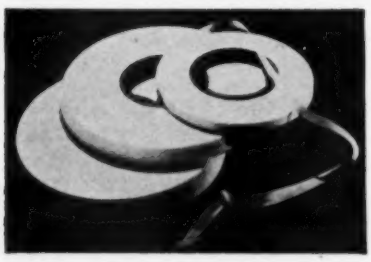
PRICE: $3,000.00 to $3,500.00. **AVAILABILITY:** From stock. **MFR:** Minneapolis-Honeywell Regulator Co., Heiland Div., 5200 E. Evans Ave., Dept EP, Denver 22, Colo. **SALES OFFICES:** See eem p. 1787 (1961-62 Ed.)

Check **176** *Reader Service Card 11/61*

TEFLON TAPE [*Chemplast, Inc.*]

eem File System Sec. 3100

Has Dimensional Stability At 250 To 300°C



For continuous use in the temperature range of 250°C to 300°C without significant change in insulating or dielectric qualities, this skived Telfon tape meets specifications MIL-7139-B, AMS 3652 and S.P.I. FD-104.

Typical values for physical and electrical properties are: minimum tensile strength 4,000 psi; elongation 300% minimum; dielectric strength (3 mil tape) 2,700 volts/mil.

Dielectric constant and dissipation factor remain constant regardless of time, temperature or frequency variations.

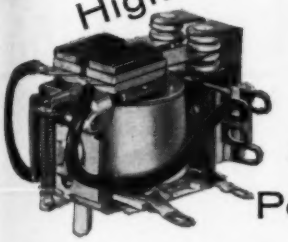
The tape is available in standard 12" widths or any increments thereof and in thicknesses from 0.002" to 0.125".

In addition to natural, 11 colors are offered to meet requirements of MIL STD 104.

PRICE: $7.00 to $10.00/lb. **AVAILABILITY:** From stock. **MFR:** Chemplast, Inc., 3 Central Ave., Dept EP, East Newark, N. J. **SALES MGR:** Miles Powell, Jr., HU 5-4850; for nearest rep see eem p. 1678 (1961-62 Ed.)

Check **177** *Reader Service Card 11/61*

88R High Reliability Miniature 15-ampere to DPDT AC and DC Power Relays



Precision-made pin-type armature hinge

STOCK RELAYS
Class 88R, DPDT, 15 amps.

voltage	Res. ohms	nominal power	catalog number
6VAC	– –	3 VA	W88ARX1
12VAC	– –		W88ARX2
26VAC	– –		W88ARX3
115VAC	– –		W88ARX4
6VDC	25	1.5W	W88RX1
12VDC	100		W88RX2
26VDC	400		W88RX3
115VDC	8000		W88RX4

249 different high reliability relay models in stock for IMMEDIATE SHIPMENT.

Send for Catalogs

and many other design advancements provide adjustment stability through long life here-to-fore equalled only by top flight telephone type relays.

You can see the difference

The design refinements and heavy duty construction are strikingly apparent to the naked eye.

SPDT and DPDT models furnished for most AC and DC voltages.

Models stocked for immediate shipment listed at left.

MAGNECRAFT ELECTRIC CO.
5573 N. Lynch, Chicago 30, Ill. Ph. Area Code 312 AV 2-5500

Check **55** *Reader Service Card*

HIGH-GAIN • ULTRA-STABLE

IF AMPLIFIERS

with custom modification flexibility to meet your specific needs

Custom flexibility is the newest ingredient in RHG's standard line of high-gain, ultra-stable intermediate frequency amplifiers. Many variations and modifications can be incorporated into the standard models detailed below without lengthy delays in delivery. Write for complete details.

MODEL NUMBER	E302	E304	E3010	E6010
Center Frequency	30 mcs	30 mcs	30 mcs	60 mcs
Bandwidth	2 mcs	4 mcs	10 mcs	10 mcs
Gain	110 db	100 db	90 db	90 db
Input Impedance	50 ohms	50 ohms	50 ohms	50 ohms
Output Impedance	50 ohms	50 ohms	50 ohms	50 ohms
Maximum Output	+13 dbm	+13 dbm	+13 dbm	+13 dbm

RHG ELECTRONICS LABORATORY, INC.
94 MILBAR BOULEVARD
FARMINGDALE
NEW YORK

Check **56** *Reader Service Card*

NEW FROM MELPAR

High Accuracy, Small Package FREQUENCY STANDARDS At New Low Cost.

CHECK THESE OUTSTANDING PRODUCT FEATURES:

- **High Accuracy (±0.01% and better)**
- **Small Package Size (under 2.9 ounces and 2.8 cubic inches)**
- **Simultaneous square wave and sine wave output**
- **Thermal stability without an oven**
- **Wide Frequency Range**
- **Resistance to thermal shock, mechanical shock and vibration**

Whatever your application . . . . . from missile guidance systems to seismic geophysical probing equipment . . . . . MELPAR'S new precision **tuning fork frequency standards** feature a unique design concept which combines accuracy and economy. Remarkable frequency accuracy is obtained **without an oven:**
±0.01% (0°C/+85°C) to ±0.05% (−55°C/+85°C) from 400 to 3000 cps.
Both a sine wave and square wave output can be obtained simultaneously from this miniature package. Tuning forks and frequency dividers also are available in the same size case.

Write today for detailed specifications and prices:

SPECIAL PRODUCTS DIVISION
MELPAR INC
A SUBSIDIARY OF WESTINGHOUSE AIR BRAKE COMPANY

3000 ARLINGTON BOULEVARD, FALLS CHURCH, VIRGINIA

Check **57** *Reader Service Card*

PROBLEMS AND SOLUTIONS FROM OUR READERS

NEW PROBLEMS

Proportional Level Indicator (No. 208) We seek a unit to yield a proportional indication of the level of granular material in a pressure vessel operating with compressed air at 100 psi. A typical vessel is a 24" dia sphere filled with aluminum oxide, glass or crushed steel granules. The device should be rugged, dust-proof, low cost.

Digital Rate Gyro Tester (No. 209) To accurately check rate gyros we need a device that will digitally read out angular rates in the range of 0.1°/sec to 10°/sec within ±0.0015°/sec. The unit must provide a readout at least four times a second, and be easily mounted to a shaft or rate table. Any associated electronics should be solid state.

Low Frequency Oscillator (No. 210) We require a low frequency oscillator to give three fixed frequencies (2 cps, 5 cps, 10 cps) ±1% over a 24-hour period.

R-C oscillators we have used are not stable enough and a crystal controlled oscillator with many reducing stages is too costly. Is there a simpler solution?

Resistant Wire (No. 211) We wish to locate a source of manganese disilicide resistant wire, or Kanthra wire. Information on the nature of the product is also desired.

SOLUTIONS TO PREVIOUS PROBLEMS

Servo-Type Potentiometer (No.175) *We seek a precision servo-type potentiometer having a life expectancy of 50 million revolutions. The significant design feature of the potentiometer involves the use of a gold-plated mylar film and ball combination, instead of the usual rotary wiper.*

Solution C: We produce a conductive plastic potentiometer which should meet all of the specifications required. The characteristics of conductive plastic — virtually infinite resolution, 50,000,000 revolutions, 500 ohms to 10 megohm range, 0.5% linearity, high reliability — are available on order. Special designs, including potentiometers with linearity of 0.1%, nonlinear functions, multigangs, special function angles and other features, can be prepared to meet specific requirements.

Catalog sheets 78P and 156P describe two standard size conductive plastic potentiometers.

B. M. Reinherz
New England Instrument Co., Waltham Mass.
For Above Literature Check **350** *Reader Service Card*

Current Converters (No. 178) *We wish to locate a source for current converters to change 110 and/or 220 volt 60 cps to 220 volt 50 cps. Consumption would be no more than 15 amp. The output should be stable and with a minimum of fluctuation to avoid error in our instrumentation. The converter must be small, so we cannot consider motor-driven generators.*

Solution C: Our Stativerter power source will rectify the 115/230 vac, single or three-phase input and convert the dc output to the desired output voltage, frequency and phase. Voltage regulation would be less than ±1%. Frequency accuracy would be better than 1% and could be ±0.001%, if required.

A specification sheet is available for further information. Additional specifications are available for a 50 cycle, 220 vac output model, fixed or variable frequency.

C. H. Dodson
Calenco Industries, Pasadena, Calif.
For Spec Sheet Check **351** *Reader Service Card*

Lamps For Emitter Circuits (No. 184) *We seek a lamp having a 0.25 v or 0.5 v drop and current ratings of 1, 3, 5 or 15 amp. Pigtail mounting would be desirable.*

To assure equal current distribution in applications using paralleled power transistors it is often necessary to use resistors

(Continued on Page 45)

TECHNICAL BOOK AWARDS FOR OUTSTANDING PROBLEMS & SOLUTIONS

Two books, from the John F. Rider Catalog, are awarded monthly to ELECTRONIC PRODUCTS *Magazine readers — one for the most interesting problem in design, engineering and procurement, the other for the best solution of the month.*

AWARD WINNERS

John Kopf, Storrs, Connecticut, for Problem 206, Oct. issue.

★A. Blumenfield, General Precision, Inc., Pleasantville, N. Y., for solution to Problem 188, Nov. issue (p. 74).

NEW transistorized GAUSSMETER MODEL 900

This quality precision built Gaussmeter provides direct reading of flux densities from 0.3 gauss full scale to 30,000 gauss with an accuracy of ±2.5%. Repeatability of readings 0.5%. Ideal for measuring and locating stray fields, plotting variations in strength and performing rapid comparisons of production lots against a standard.

SPECIAL FEATURES

- **The eleven position Range Selector provides full scale readings of 0.3, 1, 3, 10, 30, 100, 300, 1000, 3000, 10,000 and 30,000 gauss.**
- **Significant readings as low as .05 gauss.**
- **Upper range extension, for comparative readings to 100,000 gauss.**
- **Versatile—probes employing either indium arsenide or bismuth elements can be used.**
- **Operates from AC supply or from own self-contained batteries for field use.**

TRANSISTORIZED GAUSSMETER MODEL 874

This instrument was designed to provide industry with a modestly priced, precision instrument for direct reading of DC flux fields from 5 to 30,000 gauss. The 5 position Range Selector provides full scale readings of 0.3, 1, 3, 10 and 30 kilogauss by use of the temperature stable indium arsenide probe. Light in weight, completely portable and operating on internal batteries, the 874 is ideal for "in plant" or field use.

Complete with probe—$195.00

Write to

DYNA-EMPIRE Inc

1075 Stewart Avenue, Garden City, N. Y.

Check **40** *Reader Service Card*
ELECTRONIC PRODUCTS Magazine

HOWELL INSTRUMENTS, INC.

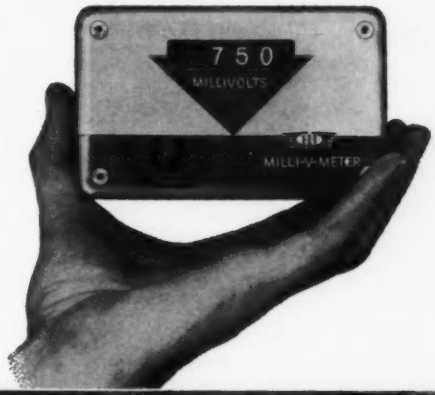
MILLI-V-METER—*The Instrument with the Tape-Slidewire—for...*

WARNING RECORDING CONTROLLING INDICATING

Direct and/or Remote
DIGITAL READOUT
ACCURATE TO

0.1%

for all functions of industrial processing plants... 1/20th cubic foot of dynamic measurement.



HOWELL temperature indicator to monitor 48 sensing locations through selector switch circuitry.

For TEMPERATURE, FREQUENCY, FLOW, LEVEL, PRESSURE, R.P.M., WEIGHT, etc.

The most comprehensive service is derived through coupling the Milli-V-Meter with warning lights, horns, controlling relays, recorders, computers, remote digital displays *...applications limited only by the imagination or ingenuity of the engineer!* The virtue of high accuracy measurement is thus the means of maintaining and improving the quality of products, the elimination of waste or loss, and the saving of time.

QUALITIES

1) Accuracy 1 part in 1000. Laboratory precision for industry or the military.
2) Compatibility with any transducer—AC or DC.
3) For strain gage, linear differential transformer, thermocouple, thermistor, resistance thermometer, pulse or variable frequency circuits or systems.
4) Operates directly from 60- or 400-cycle power as specified.

Full information is available for the asking!

Produced by the makers of JETCAL® *jet engine Analyzer ...in worldwide military and airline use!*

Sales-Engineering Offices:
ATLANTA, GA.; CHICAGO, ILL.; COMPTON, CAL.; CLEVELAND, DAYTON, OHIO; DENVER, COLO.; HOUSTON, TEX.; SEATTLE, WASH.; VALLEY STREAM, L. I., N. Y.; WICHITA, KAN.; TORONTO, ONT. (George Kolk Ltd.); MITCHAM, SURREY, ENGLAND (Bryans Aeroequipment Ltd.)

HOWELL INSTRUMENTS, INC.
FORMERLY BOH INSTRUMENT CO., INC.
3479 WEST VICKERY BLVD. • FORT WORTH 7, TEXAS

Check **41** *Reader Service Card*

EPOXY-SILICONE RUBBER POTTING COMPOUND [*Emerson & Cuming, Inc.*]

eem File System Sec. 3200 electronic engineers master

Cures And Bonds To Itself And Most Other Materials

This chemical combination of epoxy resin and silicone rubber is supplied as a two component, free flowing material, Eccosil 4712 (viscosity-60,000 centipoises).

The compound cures to a flexible material of good high temperature characteristics and retains flexibility after prolonged heat aging. It adheres, without use of a primer, to a wide variety of materials.

Properties of the fully cured epoxy are: color, red; Durometer Shore A-2 scale, 68; 24-hr water absorption, less than 0.17; dielectric strength, v/mil 750; insulation resistance, above 10^{14} ohm-cm; dielectric constant 10^2 to 10^{10} approximately 4.0; dissipation factor, 10^2 to 10^{10} below 0.02.

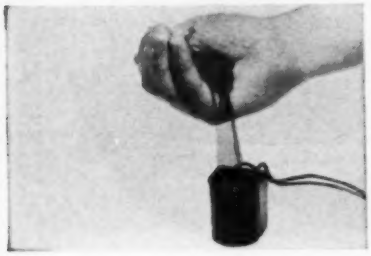
The compound has a shelf life of three months or more if properly stored under cool conditions. Sample kits are available.

PRICE: $10.00 (2 lb kit); 1 gal can $3.90 ea parts A & B; 5 gal can $3.70 ea parts A & B. **AVAILABILITY:** Contact Sales Offices below. **MFR:** Emerson & Cuming, Inc., Dept EP, Canton, Mass. **SALES OFFICES:** See **eem** p. 1714 (1961-62 Ed.)

Check **178** *Reader Service Card 11/61*

DRY-CASTING COMPOUND [*Hysol Corporation*]

Has Shelf Life Of Six Months



Dri-Cast is an epoxy-coated inorganic crystal for potting that handles the same as dry coarse power and requires no preparation prior to use.

The one-component epoxy-based material has high thermal conductivity after heat cure which assists in the dissipation of heat around windings.

Two types are available: C7-4862 is blue in color with a high density and packing factor; C7-5075 is green and of a more porous nature. The materials are designed as matrices for subsequent impregnation with transformer oil or with this manufacturer's 4251 impregnant. Following impregnation, it provides a relatively void free mass suitable for 5 kv and over.

Uncured, C7-4862 has specific gravity of 1.9 and C7-5075 of 1.6.

Curing requires 8 hours at 125°C or 4 hours at 150°C.

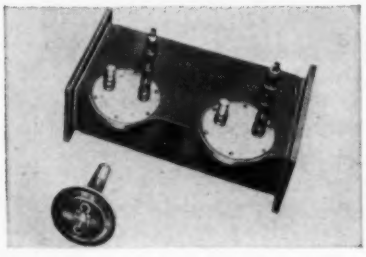
PRICE: $2.50 (trial pkg). **AVAILABILITY:** From stock. **MFR:** Hysol Corp., Dept EP, Olean, N. Y. **SALES OFFICES:** See **eem** p. 1751 (1961-62 Ed.)

Check **179** *Reader Service Card 11/61*

BI-DIRECTIONAL COUPLER [*FXR, Inc.*]

eem File System Sec. 3400 electronic engineers master

Compact Resistive Loop Couplers



This series of couplers for use with rectangular waveguide sizes from WR-2100 to WR-137 features high directivity and coupling attenuation in minimum space. They are primarily intended for power and vswr monitoring. Model No. S61-2 coupler (Illustrated), for use with WR-650 L band guide, is 15" long and can carry 15 kw average and 10 megawatts peak power when pressurized to 30 lb.

Its coupling value is 45 ±0.5 db, including frequency sensitivity, over a 10% band. Directivity is 30 db minimum from 1.27 to 1.40 kmc. Main line vswr is less than 1.05 while secondary vswr is held to 1.30. Coupling ratios from 30 to 45 db can be provided.

PRICE: Model S61-2 approx $1,2000. **AVAILABILITY:** 60 to 90 days: **MFR:** FXR, Inc., Microwave Div., Dept EP, Woodside 77, N. Y. **SALES OFFICES:** See **eem** p. 1718 (1961-62 Ed.). **OTHER PRODUCTS:** See **eem** pp. 1012, 1013

Check **180** *Reader Service Card 11/61*

BROADBAND FERRITE ISOLATORS [*Sylvania Electric Products Inc.*]

Lightweight Models Cover L-Band To X-Band

These broadband coaxial ferrite isolators operate from 1 Gc to 11 Gc using three units instead of four as previously required.

A set of units operating from 1 Gc to 4 Gc, 4 Gc to 8 Gc, and 7 Gc to 11 Gc weighs 7 pounds.

To cover the same 1 Gc to 11 Gc range with conventional isolators would require four units weighing approximately 14 pounds in total.

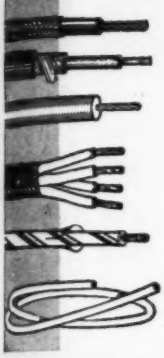
All of the broadband models provide at least 10-db isolation, with a maximum insertion loss ranging from 1.0 to 1.4 db, and maximum vswr's of 1.25:1.

In addition, the frequency bandwidths of the isolators closely fit the requirements of test equipment applications.

PRICE: Contact Sales Mgr below. **AVAILABILITY:** 4 wks. **MFR:** Sylvania Electric Products Inc., 1100 Main St., Dept EP, Buffalo 9, N. Y.

Check **181** *Reader Service Card 11/61*

Birnbach TEFLON* WIRE • CABLE • TUBING



HOOK-UP WIRE — EXTRUDED

SPECIFICATION MIL-W-16878C — **TYPE E—600 VOLT**
HIGH TEMPERATURE RATING —90° to +250°C
(Type EE-1000V Available)

Chemically inert, non-flammable, excellent flexibility, easy stripping, high dielectric strength, unaffected by fungus. Exceeds Class H insulation requirements. Unaffected by high or low temperature. Outstanding for its dependability and long life under all operating conditions indoors or outdoors. Teflon permits miniaturization and compactness in electronic designs of sub-miniature components, computers, UHF equip., slip ring assemblies, leads to hermetically sealed and potted components, telemetering equip. and guided missiles.

DESCRIPTION: single conductor silver plated copper wire concentrically stranded and insulated with extruded Teflon insulation.

†IN STOCK FOLLOWING SIZES

Cat. No. 8532 #32	Cat. No. 8524 #24	Cat. No. 8516 #16
Cat. No. 8530 #30	Cat. No. 8522 #22	Cat. No. 8514 #14
Cat. No. 8528 #28	Cat. No. 8520 #20	Cat. No. 8512 #12
Cat. No. 8526 #26	Cat. No. 8518 #18	

†STOCK COLORS

1—White 2—Black 3—Red 4—Green 5—Yellow
6—Blue 7—Brown 8—Orange 9—Gray 10—Violet

Additional sizes, tracer colors, including sub-miniature constructions available. Price and delivery on request.

TEFLON* CABES — SHIELDED AND UNSHIELDED

DESCRIPTION: One or more conductors, each conductor stranded silver plated concentrically stranded copper, type E extruded or spiral wrapped insulation. When shielded, a closely woven silver plated copper shield is braided over conductor(s). When braided, a Teflon* impregnated fiberglass is woven over the conductor(s) or shield.

BIRNBACH CAT. NUMBERS

1 Cond.	2 Cond.	3 Cond.	4 Cond.	5 Cond.	Size and Stranding		Outer Covering
8704	8704/2	8704/3	8704/4	8704/5	#24	19/36	Shield
8705	8705/2	8705/3	8705/4	8705/5	#24	19/36	Braid
8706	8706/2	8706/3	8706/4	8706/5	#24	19/36	Shield & Braid
8707	8707/2	8707/3	8707/4	8707/5	#22	19/34	Shield
8708	8708/2	8708/3	8708/4	8708/5	#22	19/34	Braid
8709	8709/2	8709/3	8709/4	8709/5	#22	19/34	Shield & Braid
8710	8710/2	8710/3	8710/4	8710/5	#20	19/32	Shield
8711	8711/2	8711/3	8711/4	8711/5	#20	19/32	Braid
8712	8712/2	8712/3	8712/4	8712/5	#20	19/32	Shield & Braid

Additional variations of the above are available to order. Multi-conductor color code: 1—White, 2—Black, 3—Red, 4—Green, 5—Yellow.

THIN WALL TEFLON* TUBING

THIN WALL BIRFLON T-500 TEFLON* TUBING DIMENSIONAL SPECIFICATIONS

AWG Size	Nom. O.D.	Nom. I.D.	Nom. Wall Thickness	AWG Size	Nom. O.D.	Nom. I.D.	Nom. Wall Thickness	AWG Size	Nom. O.D.	Nom. I.D.	Nom. Wall Thickness
32	.023"	.011"	.0085"	14	.090"	.066"	.012"	2	.293"	.263"	.015"
30	.027"	.012"	.009"	13	.100"	.076"	.012"	1	.324"	.294"	.015"
28	.032"	.015"	.009"	12	.109"	.085"	.012"	0	.360"	.330"	.015"
26	.038"	.018"	.010"	11	.119"	.095"	.012"	00	.430"	.390"	.020"
24	.042"	.022"	.010"	10	.130"	.106"	.012"	000	.483"	.433"	.020"
22	.047"	.027"	.010"	9	.148"	.118"	.015"	0000	.565"	.515"	.025"
20	.056"	.034"	.012"	8	.165"	.133"	.015"	250 MCM	.633"	.583"	.025"
19	.062"	.038"	.012"	7	.178"	.148"	.015"	300 MCM	.700"	.640"	.030"
18	.068"	.042"	.012"	6	.195"	.166"	.015"	350 MCM	.825"	.765"	.030"
17	.071"	.047"	.012"	5	.216"	.186"	.015"	400 MCM	.950"	.895"	.030"
16	.077"	.053"	.012"	4	.238"	.208"	.015"	1"	1.085"	1.025"	.030"
15	.083"	.059"	.012"	3	.264"	.234"	.015"	1¼"	1.210"	1.150"	.030"
								1¼"	1.335"	1.275"	.030"

Tolerance — Nos. 32 thru 0 — ±.003" on Wall. Nos. 00 thru 1¼" — .020" on I.D., .000" on Wall.

NO EXTRA CHARGE FOR SOLID COLORS
Small Piece Cutting Available to Order

Stock Colors: 1—White, 2—Black, 3—Red, 4—Green, 5—Yellow, 6—Blue, 7—Brown, 8—Orange, 9—Gray, 10—Violet, 11—Natural. Sizes ⅜" thru 1¼" available in Natural. Additional colors, sizes made to order. Tracer colors available. We invite your inquiries for your special requirements. Write for catalog.

ADDITIONAL ADVANTAGES OF BIRFLON T-500 TEFLON*

- **ELECTRICAL:** Low power factor, low dielectric constant, high volume and surface resistivity, good dielectric strength (500 to 1000 volts/MIL) constant over wide ranges of temperatures and frequencies. Dielectric constant of 2.0 and dissipation factor of 0.0002 are lowest of any solid dielectric.
- **THERMAL:** No change of electrical properties with temperature (25°C. to 250°C.) or frequency (60 CPS to 100 MC). Class C insulation—capable of continuous service at temperatures to 250°C. Has color stability.
- **TOUGHNESS AND FLEXIBILITY:** Has high impact strength. Is tough and flexible over the broad temperature range of —90°C. to 250°C. Service range —320°F. to 500°F.
- **CHEMICAL INERTNESS:** Completely inert to all chemicals and solvents except molten alkali metals and fluorine at elevated temperatures and pressures. Non-corrosive to all metals.
- **MOISTURE ABSORPTION:** Zero moisture absorption. Completely sun and weather resistant.
- **NON-FLAMMABLE**
- **LOWEST COEFFICIENT OF FRICTION**
- **FUNGI RESISTANCE:** Inert to all fungi growths.
- **SIZES:** Birflon T-500 Teflon Tubing available in sizes to fit B & S gauge wires. Thin wall available from stock, in sizes No. 32 thru 1¼" I.D. Additional sizes and wall thicknesses made to order.

Birflon T-500 is made from high molecular weight virgin "Teflon" and meets AMS 3651B, 3653 and MIL-C-17B specifications.

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NEREM 61
Technical Program

Papers to be presented at the fifteenth Northeast Electronics Research and Engineering Meeting (NEREM 61) in Boston are listed below for the convenience of engineers planning to attend. Digests of all papers will be issued in a conference report book.

TUESDAY, NOVEMBER 14, 1961
Commonwealth Armory (Marriott-Hogan Halls)
2:30 - 5:00 P.M.

SESSION 1: Stereo Broadcasting

Chairman: D. R. Vonrecklinghausen
H. H. Scott, Inc., Maynard, Mass.

1.1: FM Stereophonic Broadcasting Standards as Evolved Through History
H. L. Kassens, FCC, Washington, D. C.

1.2: Conversion of Existing FM Transmitters for Stereo Transmission
F. J. Bias, General Electric Co., Syracuse, N. Y.

1.3: Monitoring of FM Stereophonic Signals
A. J. DeVries, Zenith Radio Corp., Chicago, Ill.

1.4: Design Aspects of FM Stereo-Tuners and Adaptors
D. R. Vonrecklinghausen and H. H. Scott
H. H. Scott, Inc., Maynard, Mass.

Commonwealth Armory (Goldsmith Hall)
2:30 - 5:00 P.M.

SESSION 2: Region 1 Student Prize Papers

Chairman: R. E. Gildersleeve
Syracuse University, Syracuse, N. Y.

2.1: The Analysis and Design of Tunnel Diode Oscillators
R. T. Lynch, General Electric Co., Syracuse, N. Y.

2.2: The Tunnel Diode — Operation and Characteristics
G. J. Neuse, Univ. of Illinois, Urbana, Ill.

Somerset Hotel (Regency Ballroom)
2:30 - 5:00 P.M.

SESSION 3: Coherent Light

Chairman: C. Shafer
Raytheon Co., Waltham, Mass.

3.1: Generation of Optical Harmonics
P. Franken, University of Michigan, Ann Arbor, Mich.

3.2: Further Investigations on Doped Calcium Fluoride Optical Masers
P. Sorokin, IBM Research Center, Yorktown, N. Y.

3.3: Some Properties of a Gaseous Optical Maser
C. F. Luck, R. A. Paananen and H. Statz
Raytheon Co., Waltham, Mass.

Somerset Hotel (Cleveland Plaza Suite)
2:30 - 5:00 P.M.

SESSION 4: Information Theory

Chairman: D. Van Meter
Litton Systems, Inc., Waltham, Mass.

4.1: The Approximation of Realizable Ambiguity Functions
S. M. Sussman, Melpar, Inc., Watertown, Mass.

4.2: A System for Ordering Codes Based on Message Reliability
R. D. Klein, Northeastern University, Boston, Mass.

4.3: Error Probabilities for Non-Orthogonal M-ary Signals under Phase-Coherent and Phase-Incoherent Operation
A. H. Nuttall, Litton Systems, Inc., Waltham, Mass.

4.4: Adaptive Redundancy Removal
R. Van Blerkom, IBM Communications Center, Rockville, Md.

Somerset Hotel (Louis XIV Ballroom)
2:30 - 5:00 P.M.

SESSION 5: Tunneling

Chairman: J. M. Lavine
Raytheon Co., Waltham, Mass.

5.1: New Effects in Superconductivity
S. Shapiro, J. Nicol, J. L. Miles and P. H. Smith
A. D. Little, Inc., Cambridge, Mass.

5.2: Metal-Interface Amplifiers
J. P. Spratt and R. F. Schwarz, Philco Corp., Blue Bell, Pa.

5.3: Tunneling in Esaki Diodes — A Survey Including New Effects
W. Bernard, Raytheon Co., Waltham, Mass.

Somerset Hotel (Regency Ballroom)
8:00 P.M.

SESSION 6: Satellite Communications

Chairman: K. C. Black
Wayland, Mass.

6.1: The U. S. Military Communications Satellite Program
W. M. Thames, U. S. Army ADVENT M'gm't Agency
Ft. Monmouth, N. J.

6.2: Economic Aspects of Communication Satellite Systems
S. H. Reiger and W. H. Meckling
The RAND Corporation, Santa Monica, Calif.

6.3: The Design of Medium Height Random Orbit Satellite Systems
J. L. Glaser, Bell Telephone Laboratories,
Murray Hill, N. J.

6.4: NASA's Relay
R. M. Wilmotte, Astro-Electronic Products Div., RCA,
Princeton, N. J.

WEDNESDAY, NOVEMBER 15, 1961
Commonwealth Armory (Goldsmith Hall)
10:00 A.M. - 12:30 P.M.

SESSION 7: Reliability 1 — A Design Criterion

Chairman: I. Bosinoff
Sylvania Electric Products Inc., Waltham, Mass.

7.1: A Survey of Techniques for Analysis and Prediction of Equipment Reliability
H. E. Blanton, Raytheon Co., Lexington, Mass.
R. M. Jacobs, Sylvania Electric Products Inc., Waltham, Mass.

7.2: Design Considerations for Reliable Electronic Equipment
W. J. West, Autonetics, Downey, Calif.

7.3: Predicting the Reliability of Satellite Systems
R. H. Myers, Hughes Aircraft Co., Culver City, Calif.

7.4: Reliability and Design of Electronics Systems and Equipment
F. Moskowitz, Laboratory for Electronics, Boston, Mass.

Commonwealth Armory (Marriott Hall)
10:00 A.M. - 12:30 P.M.

SESSION 8: Computer Techniques

Chairman: D. R. Israel
The Mitre Corp., Lexington, Mass.

(Continued on Page 49)

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ELECTRONIC PRODUCTS Magazine

READER PROBLEMS

(Continued from Page 40)

in the emitter circuits. Volt-ampere characteristics of incandescent lamps are ideal for such use since the positive temperature coefficient of the lamp filament permits using smaller resistors as current equalizers, while serving as visual indicators of the presence of overloaded or defective power transistors. Incandescent lamps commonly available are not suited for this purpose.

Solution A: Positive temperature coefficient wires known as Balco Wire have volt-ampere characteristics approximating those of an incandescent lamp. When heated to approximately 1,100°F by an electrical current, the wire glows red, which can serve as a visual indicator of overloaded or defective transistors. The ratio of resistance at room temperature to resistance at 1,100° F is approximately one to five.

Balco wires of various gages would indicate at 1 to 15 amp. In each case the wire length needed would only be a couple of inches for the required voltage drop of 0.25 v of 0.50 v. This seems an inexpensive solution to the problem. For details write the Wilbur B. Driver Co., Newark, N. J. manufacturers of Balco wire.

E. M. Goldberg,
Research Engineer,
American Type Founders,
Elizabeth, N. J.

Angle Counter (No. 185) *We seek an angle counter having a continuous display from 000 deg to 359 deg for one input shaft rotation, and then repeating the cycle from 000 deg for any further rotation in the same direction. Three digits are required but four will be acceptable.*

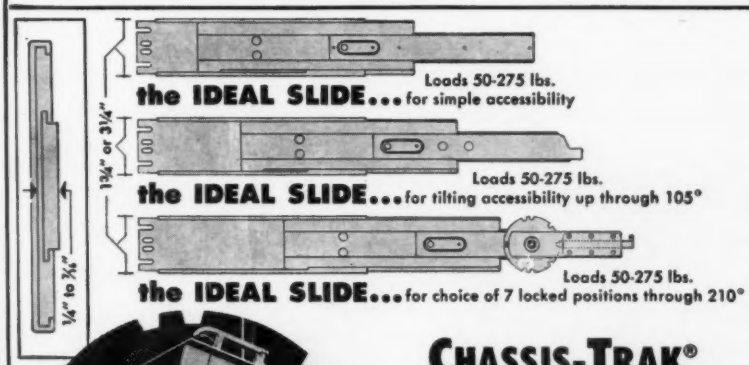
The counter must be bidirectional and the size of the display should be larger than ¾" with minimum horizontal spacing between counter drums.

The input shaft speed is less than 10 rpm.

An electrical substitute in the form of a small code wheel with electrical readout directly from code wheel will be acceptable.

Solution D: Bowmar Instrument Corp., Ft. Wayne, Indiana, has a revisible mechanical angle counter

(Continued on Page 73)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Loads 50-275 lbs.
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San Francisco: HIlltop 7-2220 . . . Portland: MElrose 3-5858

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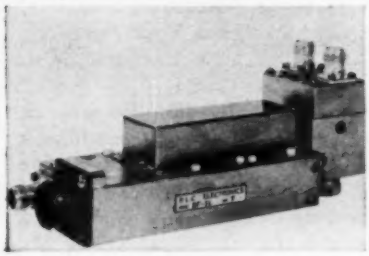
COAXIAL R-F FRONT ENDS [*R L C Electronics, Inc.*]

eem File System Sec. electronic engineers master 3400

For Operation From 250 Mc To 7 Gc



Series RF coaxial mixer-preamplifier front end assemblies utilize a balanced mixer and a 30-mc preamplifier. They permit octave bandwidth coverage with minimum local oscillator power and maximum isolation.

Utilization of ceramic tubes as i-f amplifiers permit their use under severe environmental conditions.

The units are available for the frequency ranges of 250 to 500 mc (Model RF-U1), 500 to 1,000 mc (Model RF-U2), 1 to 2 Gc (Model RF-L), 1.7 to 2.4 Gc (Model RF-SI), 2 to 4 Gc (Model RF-S) and from 4 to 7 Gc (Model RF-C).

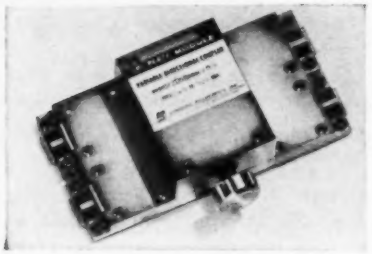
A noise figure of 7.5 db maximum with an overall band width of 8 mc, and a power gain of 20 db assures a receiving system requiring no special i-f circuitry.

PRICE: $650.00. **AVAILABILITY:** 30 days. **MFR:** R L C Electronics, Inc., 805 Mamaroneck Ave., Dept EP, Mamaroneck, N. Y. **SALES MGR:** Alan Borck, OW 8-7440, for nearest rep see **eem** p. 1819 (1961-62 Ed.)

Check **182** *Reader Service Card 11/61*

VARIABLE DIRECTIONAL COUPLER [*Sanders Associates, Inc.*]

Broadband, Over 1 Octave



Tri-Plate variable directional coupler Model MVD-62 controls microwave energy by varying the critical spacing between two center conductors in strip transmission line. Coupling as tight as 3 db and as loose as 50 db can be achieved with a single component over a wide frequency band.

Standard modules with center frequencies of 0.15, 0.4, 0.75, 1.5, and 3.0 Gc are available. Models with optimum coupling at 3 db, 10 db, and 20 db are standard for operation in each frequency band. Custom units with almost any center frequency and optimum coupling can be supplied on special order.

Standard models are furnished with TPM connectors; units are also available with any of the common coaxial connectors. One watt terminations and different drive mechanisms are available.

PRICE: $400.00. **AVAILABILITY:** Stock to 30 days. **MFR:** Sanders Associates, Inc., 95 Canal St., Dept EP, Nashua, N. H. **SALES MGR:** D. Ayer, TU 3-3321, for nearest rep see **eem** p. 1833 (1961-62 Ed.)

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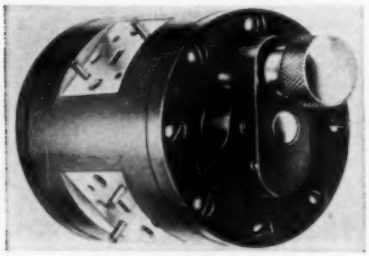
MECHANICAL WAVEGUIDE SWITCHES [*Technical Research Group, Antenna & Microwave Dept.*]

For Test Bench And Microwave Systems



These hand operated waveguide switches are available in two models: Model 530 switches energy from a single input port to any one of three output ports; Model 540 switches energy from a single input port to any one of two output ports.

The rotor consists of a split brass cylinder into which is milled the switching waveguide bends. The stator and outer case consists of the waveguide port designed to mate with the applicable standard flanges and a cylindrical inner diameter to accept the rotor.

A noncontacting choke coupling is used at all transmission line junctions. A spring loaded pin in socket hand crank provides positive indexing switching action.

The devices operate over the full waveguide bandwidth with the following characteristics; insertion loss 0.3 db; vswr 1.15; isolation 40 db min.

PRICE: $550.00. **AVAILABILITY:** Contact Sales Mgr below. **MFR:** Technical Research Group, 9 Union Sq., Dept EP, Somerville, Mass. **SALES MGR:** G. J. Brown, MO 6-8680

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COAXIAL SWITCH [*K & G Manufacturing Co., Inc.*]

Corrosion Resistant—Utilizes Teflon Insulation

For use in r-f circuits where a compact, constant impedance switch having low vswr is required, this coaxial unit is offered for manual or motorized operation.

Mounting in a single ½" diameter hole with key, the device has shorting or nonshorting solid silver contacts for extended life. Fabricated of gold-plated brass with wear portions of stainless steel, the switch is supplied with Type N connectors.

The operating temperature range, of the 2" long unit (from the mounting flange) with a radial diameter of 2⅞", is from −40° centigrade to 60° centigrade.

Electrical specifications include: range 0 to 11 kmc; vswr 1.5 to 1.0 max; impedance 51 ohms; r-f power rating 100 w; insertion loss 0.2 db max; configuration single pole, one to six positions can be supplied for remote operation.

PRICE: $75.00 ea (qty disc). **AVAILABILITY:** From stock. **MFR:** K & G Manufacturing Co., Inc., Switchtronics Div., 711 S. Fulton Ave., Dept EP, Mt. Vernon, N. Y.

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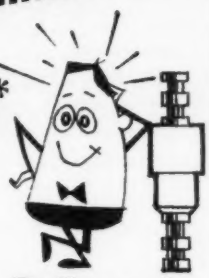
Taurus Terminals of Teflon*



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ELECTRONIC PRODUCTS Magazine

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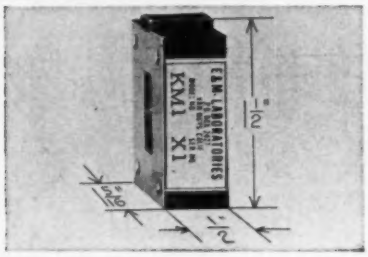
MINIATURE KU-BAND ISOLATORS [*E & M Laboratories*]

eem File System Sec. electronic engineers master 3400

Light Weight—Low Insertion Loss



For use in parametric amplifier designs and in miniature microwave systems, all seven units in this series of miniature microwave Ku-band isolators are ½" long and weigh less than 1¼ ounces.

The entire series exhibit the following specifications: nominal insertion loss of 0.3 db; isolations up to 25 db; temperature range of −40°C to 85°C; capability of operating in close proximity to external magnetic fields.

Model KM1 has a frequency range from 12.6 to 12.8 Gc, KM2 from 12.8 to 12.85 Gc, KM3 from 13.0 to 13.1 Gc, KM4 of 13.2 to 13.4 Gc, KM5 from 13.45 to 13.55 Gc, KM6 from 13.4 to 13.6 Gc, and KM7 covers the 13.9 to 14.0 Gc range.

These isolators, of the in-line field displacement type, do not require a connective waveguide twist.

PRICE: $175.00 ea. **AVAILABILITY:** Contact Sales Offices below. **MFR:** E & M Laboratories, 1516 Califa St., Dept EP, Van Nuys, Calif. **SALES OFFICES:** See **eem** p. 1703 (1961-62 Ed.)

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PORTABLE STANDING WAVE AMPLIFIER [*FXR, a Div. of Amphenol-Borg Electronics Corp.*]

Transistorized—Accuracy ±0.05 Db

Standing-wave amplifier B813T's accuracy of ±0.05% holds true for both the full scale meter movement and for each 5-db step on the range switch. The meter and linear amplifier give a full scale maximum error at 5 db of only ±0.05 db.

Calibrated range of the instrument is 75 db. Normal, expanded and compressed meter scales are provided and can be used interchangeably without need for readjustment of the gain control.

Designed for use on battery power for field applications where power is not available, or in the laboratory where line noise might cause inaccuracies in measurement, the unit can be operated from line power if desired.

The device has bolometer protection and a meter display for bolometer resistance checking and current adjustment.

PRICE: $285.00 (with rechargeable battery). **AVAILABILITY:** 60 to 90 days. **MFR:** FXR, Inc., Microwave Instrument Div., 25-26 50th St., Dept EP, Woodside 77, N. Y. **SALES OFFICES:** See **eem** p. 1718, (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1012, 1013

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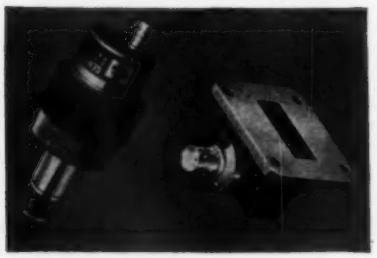
COAXIAL AND WAVEGUIDE THERMISTOR MOUNTS [*General Microwave Corp.*]

Broadband Units — 0.01 To 18.0 Gc Range



Covering the frequency range from 0.01 to 18.0 Gc, Model 401 Series of coaxial and waveguide thermistor mounts measure average power from a few μw to 10 mw. They operate in conjunction with GMC Model 451 microwave power meter and other r-f power instruments capable of operating with a 100 or 200-ohm negative temperature-coefficient detector.

Temperature-resistance characteristics of the thermistors used minimize burnout. When subjected to overload, the thermistor's resistance drops rapidly and the resulting r-f mismatch causes most of the incident power to be reflected.

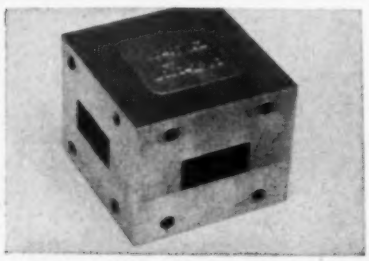
These devices are suited for the measurement of both c-w or pulsed power.

PRICE: $75.00 to $110.00 (depending on requirement). **AVAILABILITY:** Stock to 30 days. **MFR:** General Microwave Corp., 47 Gazza Blvd., Dept EP, Farmingdale, N. Y. **SALES MGR:** Moe Wind, MY 4-3434; for nearest rep see **eem** p. 1733 (1961-62 Ed.)

Check **188** *Reader Service Card 11/61*

FERRITE CIRCULATORS [*Sylvania Electric Products Inc.*]

For Microwave Communications Equipment



These three-port ferrite circulators operate over a −30°C to 70°C range without temperature compensation.

The devices are fitted with RG-50, RG-51, RG-52, or WR-75 waveguides.

Units are available in versions covering the following frequency bands: 5.4 to 5.9 Gc, 5.925 to 6.425 Gc, 6.575 to 7.124 Gc, 10.7 to 11.7 Gc, and from 12.2 to 12.7 Gc.

The circulators offer 20-db min isolation, 0.5-db max insertion loss, and 1.2 to 1.0 max vswr. They withstand up to 10 watts cw or average power.

Weighing 2 pounds, the units' dimensions are 2 61/64" by 3¼" by 2¼".

Applications include use in common carrier equipment and transceivers.

PRICE: $100.00 to $200.00 (depending on qty). **AVAILABILITY:** 30 to 45 days. **MFR:** Sylvania Electric Products Inc., 1100 Main St., Dept EP, Buffalo 9, N. Y.

Check **189** *Reader Service Card 11/61*

NEREM TECHNICAL PROGRAM

(Continued from Page 44)

SESSION 8: (Continued)

8.1: A Low-Power, High-Speed Transistor, Tunnel-Diode Hybrid Logic Circuit
J. A. Ekiss and P. Spiegel, Philco Corp., Lansdale, Pa.

8.2: Digital Circuits with a Minimum Number of Tunnel Diodes
B. Rabinovici and J. Klapper, RCA, New York City, N. Y.

8.3: The Maximum Efficiency Concept for High-Speed Random-Access Memories
M. M. Stern and H. A. Ullman
Sylvania Electric Products Inc., Needham, Mass.

8.4: Diode and Transistor Logic in Synthesis of Symmetric Boolean Matrices
H. K. Cooper, Pacific Semiconductors, Inc., Lawndale, Calif.

Somerset Hotel (Louis XIV Ballroom)
10:00 A.M. - 12:30 P.M.

SESSION 9: Radio Astronomy 1

Chairman: J. Ruze
Radiation Engineering Laboratory, Maynard, Mass.

9.1: Fundamental Requirements of Radio Astronomical Measurements
A. E. Lilley, Harvard College Observatory, Cambridge, Mass.

9.2: An Attempt to Detect the Galactic Deuterium Line Using Digital Autocorrelation Techniques
S. Weinreb, MIT, Cambridge, Mass.

9.3: Radiometric Instrumentation at Eight Millimeters
J. W. Meyer, J. J. Kirwan and D. M. Towle
MIT Lincoln Laboratory, Lexington, Mass.

9.4: The (1 — cos ϕ) Radiometer
J. W. McGinn, Jr., MIT Lincoln Laboratory, Lexington, Mass.

Somerset Hotel (Regency Ballroom)
10:00 A.M. - 12:30 P.M.

SESSION 10: Solid-State Devices and Materials

Chairman: H. G. Rudenberg
Transitron Electronic Corp., Boston, Mass.

10.1: Varactor Diodes for Microwave Applications
K. E. Mortenson, Microwave Associates, Burlington, Mass.

10.2: Recent Advances in Transistors
T. A. Longo, Sylvania Electric Products Inc., Waltham, Mass.

10.3: Trends and Topics in New Materials
W. C. Dunlap, Raytheon Company, Waltham, Mass.

10.4: The Performance of Solar Cells in Space Environments
F. M. Smits, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Somerset Hotel (Cleveland Plaza Suite)
10:00 A.M. - 12:30 P.M.

SESSION 11: Automatic Control

Chairman: J. T. Thomas
Minneapolis Honeywell Regulator Co., Boston, Mass.

11.1: The Dynamic Analysis of Limit Cycling Systems: A Prelude to Limit Cycling Adaptive Design
A. Gelb, Dynamics Research Corp., Stoneham, Mass.

11.2: A Synthesis Technique for Quasi-Optimal Relay Control
R. R. Sparacino, A. C. Spark Plug Eng. Facility, Wakefield, Mass.

11.3: Obtaining the Roots of the Characteristic Equator by Analog Computer Techniques
G. W. Ogar, Institute of Technology, Wright-Patterson AF Base. O.

11.4: Considerations Relating to the Open-Loop Compensation of Dynamic Tracking Errors
S. Adelman and S. M. Shinners, Sperry Gyroscope Co., Great Neck, N.Y.

11.5: Recent Developments in Bang-Bang Control
Y. C. Ho and P. Brentani, Minneapolis-Regulator Co., Boston, Mass.

11.6: The Foundation for Limit Cycling Adaptive Design
A. Gelb, Dynamics Research Corp., Stoneham, Mass.

Commonwealth Armory (Goldsmith Hall)
2:30 - 5:00 P.M.

SESSION 12: Reliability II

Chairman: M. V. Ratynski
Electronic Systems Division, USAF, Hanscom Field, Bedford, Mass.

12.1: Design Reliability Creation Through Management Directives
J. W. Griswold, The Boeing Co., Seattle, Wash.

(Continued on Page 65)

New Revolutionary Concept In Pushbutton Switch Design

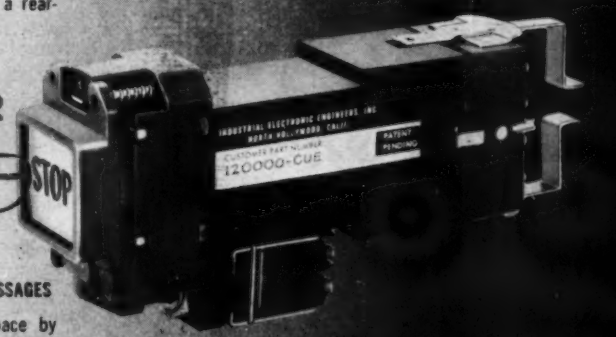
The newly designed IEE **Cue** Indicator Switch has the capacity to display twelve different messages on its viewing screen, which is also the "push-button" of the switch. Messages are displayed by the use of a rear-projection display system.

CUE INDICATOR

SWITCH

OFFERS 12 INTERCHANGEABLE MESSAGES

Ability to reduce overall panel space by 1200% may be achieved by combining twelve different messages into one **Cue** Indicator Switch, resulting in ten **Cue** Indicator Switches doing the job of 120 conventional switches. Switches with readout communication capabilities employing words, color, numbers, and symbols herald a new era in control applications.



Write today for prices and complete detailed specifications.

Representatives in principal cities.

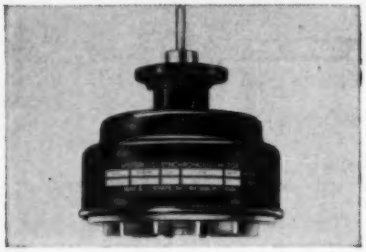
INDUSTRIAL ELECTRONIC ENGINEERS, INC.
5528 Vineland Avenue • North Hollywood, California

Check **49** *Reader Service Card*

HYSTERESIS SYNCHRONOUS MOTOR [*Beau Electronics, Inc.*]

eem File System Sec. electronic engineers master 3500

Dual Speed—Unaffected By Transients



Offering constant-speed outputs of 300 or 600 rpm insensitive to voltage changes, this hysteresis synchronous motor can be used continuously without shutoff.

Type 5003 a-c motor drives large inertial masses at a constant rate of speed. The motor's integrated drive eliminates the need for dual output shafts and dynamically balanced flywheels while maintaining close output shaft tolerances.

Operable within a temperature range of from −65°F to 165°F, the low-noise motor employs precision sealed ball bearings and supplies 9 oz-in. of synchronous torque.

Input voltage is rated at 115 v single phase, variable 40 v in either direction, while power input is 28 watts max.

Production models have operated in excess of 10,000 hr, it is stated, with max unbalance remaining at 0.004 oz-in.

PRICE: $95.00 (single units). **AVAILABILITY:** 30 days. **MFR:** Beau Electronics, Inc., 1060 Wolcott Rd., Dept EP, Waterbury, Conn.

Check **190** *Reader Service Card 11/61*

SCINTILLATION DETECTOR KIT [*Radiation Equipment & Accessories Corp.*]

eem File System Sec. electronic engineers master 3600

For All Types Of Nuclear Radiation

Scinti-Kit E-160 used with scalers measures all types of radiation including alpha, beta, and gamma. Due to interchangeability of the crystals, only one photomultiplier tube is required for use with 12 different phosphors.

The basic kit consists of a probe housing, a photomultiplier tube and five commonly used scintillators: a sodium iodide (T1) crystal for gamma detection, a sodium iodide (TL) well type crystal, a plastic phosphor for general purpose detection, a thin zinc sulfide crystal for alpha detection and an anthracene crystal for beta detection.

Seven additional crystals are available for neutron detection and other special applications. A descriptive booklet on the theory and applications of scintillation counting is included.

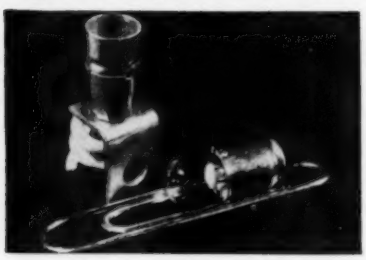
PRICE: $475.00 (with 5 crystals). **AVAILABILITY:** From stock. **MFR:** Radiation Equipment & Accessories Corp., 665 Merrick Rd, Dept. EP, Lynbrook, N. Y. **SALES MGR:** J. Weinstein, LY 3-3570

Check **191** *Reader Service Card 11/61*

MIDGET GROOVE LAMPHOLDER [*Webster Electronics Co., Inc.*]

eem File System Sec. electronic engineers master 3900

Height 0.4 Inch, Diameter 0.244 Inch



Series WE700 lampholders provide a low density-longevity base for use with T/TL 1¾ midget groove lamps.

Special mounting brackets allow panel mounting on ¼" centers. The lamp is held securely in a nontilt position and is guaranteed vibration proof.

This series of lampholders come with standard 6" length of 22 ga 7/30, 0.025"-wall pvc wire. The housing is manufactured of 0.01 annealed spring steel, hardened, tempered and cadmium plated.

A variety of standard mounting brackets are available together with plastic (butyrate) lens caps in numerous colors.

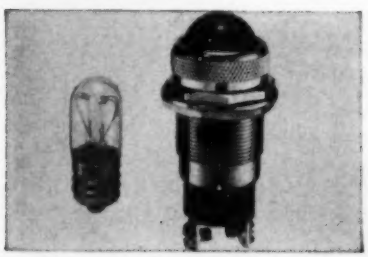
Numerical, alphabetical, or word designations are available on all lense caps.

PRICE: $0.25 ea to $400.00/M (depending on requirements). **AVAILABILITY:** Contact Sales Offices below. **MFR:** Webster Electronics Co., Inc., 237 Lafayette St., Dept EP, New York 12, N. Y. **SALES OFFICES:** See **eem** p. 1881 (1961-62 Ed.)

Check **192** *Reader Service Card 11/61*

TWO-FILAMENT LAMP [*General Electric*]

Six-Watt, 125V Unit



Making possible further miniaturization of pilot light assemblies, this rugged, 6-watt bulb is ½" in diameter and 1 7/16" long, including candelabra screw base.

For operation on standard-voltage circuits, the lamp employs an unusual filament construction.

Two separate 3-watt, low-voltage coiled tungsten filaments are connected in series. Instead of having the usual one-filament mount construction, the lamp uses two mounts, one to support each filament.

The lamp produces a light output of 36 lumens. Its filament design so spreads the light that it can be used effectively with lenses of all colors in dial lights or other indicator applications.

Voltage rating is 125, giving the bulb an average life of 1,500 hours.

PRICE: $0.95 (list). **AVAILABILITY:** Contact Mfr below. **MFR:** General Electric Co., Dept EP, Schenectady 5, N. Y.

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new... high resolution C.R.T. employs electro-static focus-lens

This new improved high resolution C.R.T. developed by Thomas Electronics features:

- Genuine 0.001" line width
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- Tubes available in 3" and 5" screen sizes, with high voltage terminals encapsulated to high altitude specifications
- Available from stock with P1, P11, P16, and P24 phosphor screens

Thomas ELECTRONICS INC.

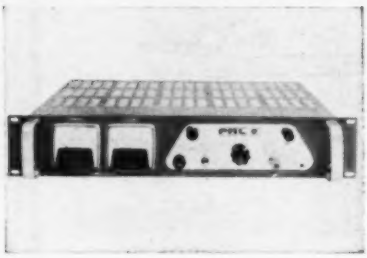
INDUSTRIAL AND MILITARY CATHODE RAY TUBE DIVISION
118—9th Street, Passaic, New Jersey • GR 3-4040

Check **51** *Reader Service Card*

TRANSISTOR REGULATED POWER SUPPLIES [*PRL Electronics, Inc.*]

eem File System Sec. electronic engineers master 4000

Remote Sensing And Programming



Known as the CM Line, 6 models of these transistor regulated power supplies are available in 3 voltage ranges. The ranges are 0 to 18 vdc (either 8 or 12 amp output), 0 to 36 vdc (at 3, 5, and 8 amp), and 0 to 60 vdc at 5 amp.

With 0.01% regulation, ripple voltage is one millivolt rms. Units can be operated in series, parallel, or with automatic current limiting.

Supplies are 3½" high, 14½" deep and mount on a 19" rack. Top and bottom dust covers are provided for bench top operation. Weight is 35 pounds. No blowers are used in the units.

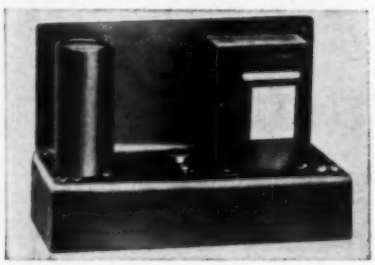
Two meters of 2% accuracy full scale are mounted in the front panel to monitor both output voltage and current. Ambient temperature range is from 0° C to 50° C.

PRICE: From $335.00 to $645.00. **AVAILABILITY:** From Stock. **MFR:** PRL Electronics, Inc., 232 Westcott Drive, Dept EP, Rahway, N. J. **SALES MGR:** A. L. Karp, FU 1-5800; for nearest rep see **eem** p. 1803 (1961-62 Ed.)

Check **194** *Reader Service Card 11/61*

REMOTE SENSING POWER SUPPLIES [*NJE Corporation*]

Circuit Has 25 Ohms/Volt Sensitivity



Featuring remote sensing and programming, Models P-56-0.5 and P-72-0.5 have sensing leads, separate from the output leads, which sense and regulate against the voltage at the load.

Model P-56-0.5 has an output of 36 to 56 volts, and Model P-72-0.5 has an output of 56-72 volts. Both units deliver 0 to 0.5 amp from input power of 115 vac, 55 to 400 cps. Maximum ripple is 5 millivolts peak to peak. Static regulation for the load is ±0.05%, no load to full load. For the line, regulation is ±0.05% for ±10% line variation.

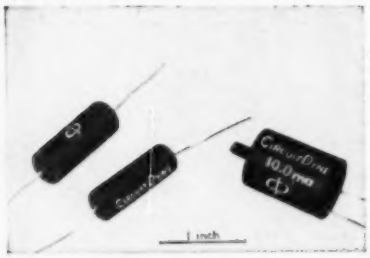
Units measure 5" x 8" x 3¼" and weigh 4½ lbs. Recovery time is 50 μsec. Units will operate continuously at 35° C, derating linearly to zero at 75° C. Stability is ±0.2% per day under lab conditions.

PRICE: $110.00. **AVAILABILITY:** From Stock. **MFR:** NJE Corp., 20 Boright Ave., Dept EP, Kenilworth, N. J. **SALES MGR:** H. S. Evans, DR 6-7300; for nearest reps see **eem** p. 1792 (1961-62 Ed.). **OTHER PRODUCTS:** See **eem** pp 1207, 1221

Check **195** *Reader Service Card 11/61*

CONSTANT-CURRENT REGULATOR [*CircuitDyne Corp., Subs. Telonic Industries, Inc.*]

Typical Admittance Of 1 Micro-Ohm



Comparable to the voltage-regulating zener diode, this two-terminal Currector, limits current in electrical networks.

The solid-state unit is available in fixed current ratings of 1 to 10 ma in 10% increments.

Standard current tolerance is ±5% and both polarized and nonpolarized versions are available.

The high incremental-to-static resistance ratio device can replace a number of other circuit components, reducing size, weight, and production time of finished assemblies. Encapsulated in epoxy, it is easily adapted to circuit board installation.

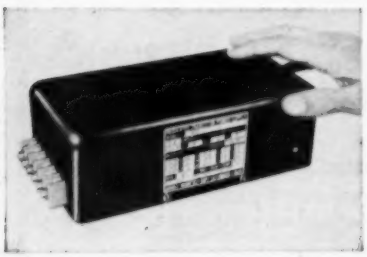
The units are also available in single-ended plug-in types and high-temperature militarized designs.

PRICE: $6.30-$32.00. **AVAILABILITY:** 2 wks. **MFR:** CircuitDyne Corp., a Sub. of Teonic Industries, Inc., 480 Mermaid St., Dept EP, Laguna Beach, Calif.

Check **196** *Reader Service Card 11/61*

THREE-PHASE STATIC INVERTER [*Arnold Magnetics Corp.*]

28 VDC To 100-VA Sine-Wave Output



For driving 3-phase a-c motors, a-c gyros, and magnetic amplifiers from a 28 v battery source, this static inverter, Model K33, features self-protection against line transients, short-circuits, overloads, reactive loads, load transients, and reversal of input polarity.

The solid-state unit has complete absence of radio noise, and is tested for compliance to MIL-E-7894 ASG (line spikes of a 60 v peak). Hermetically sealed, it is insensitive to widely varying load impedances and power factors.

Output contains 2% harmonic distortion, and is regulated to close limits.

Small in size (4" x 7¾" x 2½" h), the supply is fully potted to meet requirements of MIL-E-5272C ASG, including vibration heat, and moisture.

PRICE: $600.00. **AVAILABILITY:** 30 days. **MFR:** Arnold Magnetics Corp., 6050 W. Jefferson Blvd., Dept EP, Los Angeles 16, Calif. **SALES OFFICES:** See **eem** p. 1652 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1128, 1254, 1516-1518

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DIGITALLY MEASURE EVERYTHING!

This **FREE** 16-page data file tells how you can take standard digital instrumentation and build a DME* system that will digitally and precisely measure all or any of the following:

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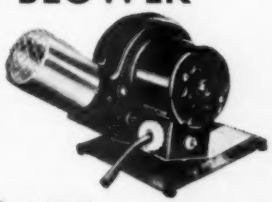
FOR QUICK HEAT up to 1,000° F.

Ideal for shrinking heat shrinkable irradiated polyolefin tubing and sleeving.

For application requiring quick concentrated heat blast up to 1000°F, without flame. Soften, form, mold and patch plastics, etc. Temperature varied by air intake adjustment. 110-230 V. AC-DC motor. 3 wire plug. All 110 V. models equipped with adapter for 2-prong receptacle. 8 ft. heavy duty cord. Intermittent duty. Other models available with lower temp. ranges. Most of the big names in industry use MASTER HEAT BLOWERS in laboratories or in production.

Model HG 501 — 500°F. 115 V. — $41.25
(Others $37.25 to $62.75)

AIR HEATER BLOWER



For quick electrically heated air up to 750°F. For accelerating drying processes or for localized heating. B.T.U. 3400. Air velocity 2000 FPM. 110-230 V. AC only. 3 wire plug. All 110 V. models equipped with adapter for 2-prong receptacle. 8 ft. heavy duty cord. Continuous duty. 2" dia. x 3" long discharge nozzle.

Model AH 501—500°F.—115 V.—$55.35
(Others $52.25 to $83.25)

Write today to Dept. 171-K

Master APPLIANCE CORP., RACINE, WISCONSIN

Check **53** *Reader Service Card*

Advanced models of Dymo Tapewriter® are here now!

Professional raised-letter labels made on-the-spot for every type of application. Solve identification problems with industry's most versatile labeling system. Three *all new* DYMO Tapewriters are now available... Model M-11 for making metal labels, Models M-22 and M-33 for self-sticking plastic labels. Tapes available in 10 coding colors. An entirely new line of two-color tapes... plus a revolutionary contrasting aluminum tape!

Tapewriters start at $39.50. Ask your distributor or write for sample and literature today.

Dymo Industries, Inc. / Dept. EPM-11 / 2950 7th St. / Berkeley, Calif.

(TAPE SHOWN ACTUAL SIZE)

IDENTIFICATION SYSTEM

Check **54** *Reader Service Card*

VOLTAGE/CURRENT REGULATED POWER SUPPLY [*Kepco, Inc.*]

eem File System Sec. 4000 electronic engineers master

Transistorized—For Bench Or Systems Use

Small size, 4¼" h x 8$^{5}/_{32}$" w x 5⅝" d, Model ABC 30-0.3M power supply for (one or two-abreast) rack mounting or chassis mounting as a self-contained module has an output of 0 to 30 vdc at 0 to 300 ma.

Line regulation is 0.05% for 105-125 vac line change at any output voltage within the specified range. Load regulation is 0.05% or 3 mv, whichever is greater.

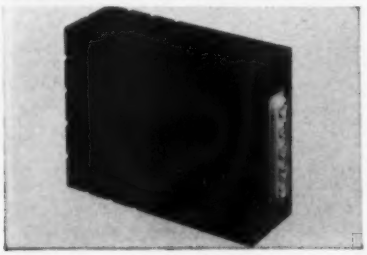
Other electrical specifications are: stability less than 0.05% or 6 mv, whichever is greater, over a period of 8 hr at constant ambient temperature; ripple and noise less than 0.5 mv rms; output impedance is less than 0.05 ohm, dc to 1 kc, and less than 0.5 ohm, 1 kc to 100 kc; recovery time 50 μsec; ambient operating temperature range —20°C to 50°C; temperature coefficient 0.05%/°C.

PRICE: $119.00; $99.00 (less meter). **AVAILABILITY:** Contact Sales offices below. **MFR:** Kepco, Inc., 131-38 Sanford Ave., Dept EP, Flushing 52, N. Y. **SALES OFFICES:** See **eem** p. 1764 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1164-1187

Check **198** *Reader Service Card 11/61*

A-C/D-C STATIC CONVERTERS [*Varo, Inc., Electrokinetics Div.*]

Have Magnetic Amplifier Regulation



Completely sealed in an epoxy encapsulation with an aluminum outer housing, Power-Bloc modules are manufactured in over 40 standard ratings, from 1 v at 10 amp to 30 v at 0.8 amp.

The d-c output voltage of the full-wave rectifier, choke filter module is developed across a diode which forms a sensing circuit for a magnetic amplifier controlling the output of the bridge rectifier network. This feedback loop stabilizes the voltage across the diode for a low static and dynamic output impedance.

The unit's transient response is controlled primarily by the diode, which clamps the output voltage during load transients.

PRICE: $150.00-$295.00. **AVAILABILITY:** Contact Sales Offices below. **MFR:** Varo, Inc., Electrokinetics, Div., 402 East Gutierrez St., Dept EP, Santa Barbara, Calif. **SALES OFFICES:** See **eem** p. 1873 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1250

Check **199** *Reader Service Card 11/61*

ELECTROSTATIC GENERATORS [*SAMES (Societe Anonyme de Machines Electrostatiques)*]

Infinitely Variable Voltages To 600 Kv DC At 4 Ma

Weighing less than 2,400 pounds each, these two generators are packaged in three modules so the control and low-voltage sections may be remotely located from the high-voltage section. Input voltage for each model is 220/380 volts, three-phase, 60-cps standard 50-cps optional.

Model AKS600-4 can be switched to provide either medium or high-stability output. Ripple is 0.01%; full-load voltage drop never exceeds 500 volts; regulation is less than 0.1% for a 5% line change.

Model AK600-4 holds ripple to ±1% peak; full-load voltage drop is less than 10 kv; and regulation is less than 0.5% for a 5% line change.

Applications include nuclear physics, electron microscopy, cable and insulation testing, mineral separation, condenser bank charging and electrostatic precipitation.

PRICE & AVAILABILITY: Contact Mfr below. **MFR:** SAMES, 30 Broad St., Dept EP, New York 4, N. Y.

Check **200** *Reader Service Card 11/61*

PORTABLE PRIME POWER SOURCE [*Consolidated Diesel Electric Corp., Power Equipment Div.*]

Any Combination Of Standard Voltages To 7.5 Kw

Powered by a light-weight air-cooled diesel engine, generator Model 2012-AS delivers 28.5 vdc; 120 vac, 400 cps and 120/208 vac, 60 cps for electronic equipment.

The engine-generator and control panel unit weighs 1,100 pounds and measures 49" in length, 31" in width and 36" in height. It can deliver 4 kw dc, 6 kw of 400 cps, 6 kw of 60 cps, or any combination of the standard voltages, not exceeding a total of 7.5 kw.

The 400-cps a-c output is three-phase, three-wire. The 60-cps output is three-phase, four-wire.

The control panel includes: an output multimeter for each voltage; meter selector switches, transformers and shunts; voltage regulator and engine controls.

PRICE: $10,000.00 — $12,000.00. **AVAILABILITY:** 90 days. **MFR:** Consoidated Diesel Electric Corp., Power Equipment Div., 880 Canal St., Dept EP, Stamford, Conn. **SALES MGR:** F. Cesario, DA 5-2261; for nearest rep see **eem** p. 1686 (1961-62 Ed.)

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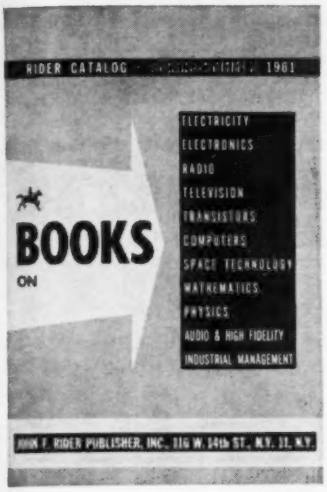

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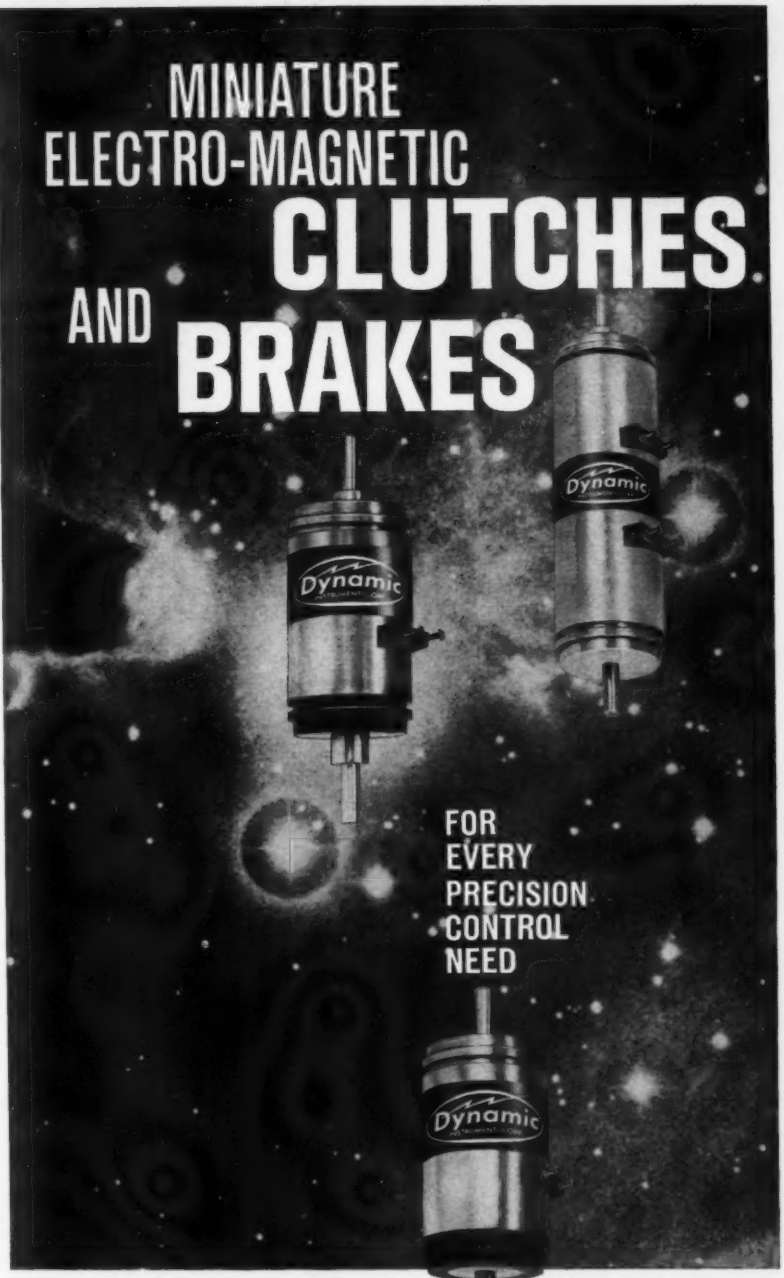
MINIATURE ELECTRO-MAGNETIC CLUTCHES AND BRAKES



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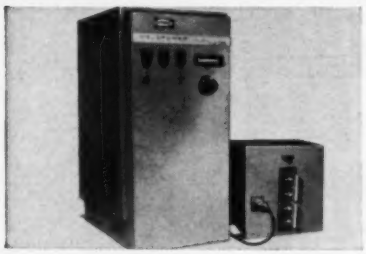
WELDING POWER SUPPLY [*Raytheon Co., Commercial Apparatus & Systems Div.*]

eem File System Sec. electronic engineers master 4000

Incorporates Watt-Second Meter For Accurate Set-Ups



Weldpower Model 225B power supply stores and releases precise welding energy of 20 to 225 watt-seconds permitting 50 to 120 spot-welds per minute. It is said to operate on a fraction of the power required by most a-c welders. It stores and discharges the same amount of power for each weld, regardless of normal line voltage fluctuations.

By accumulating energy within 0.5 to 1.0 sec after each weld and then discharging it in a pulse of a few millisec, the supply tends to eliminate burning or oxidation of electrode tips and workpieces while welding metals of high electrical and thermal conductivity.

A separately mounted transformer is provided; its primary and secondary can be connected for parallel or series operation.

PRICE: $1,244.00. **AVAILABILITY:** From stock. **MFR:** Raytheon Co., Commercial Apparatus & Systems Div., 225 Crescent St., Dept EP, Waltham 54, Mass. **SALES OFFICES:** See **eem** p. 1823 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1546

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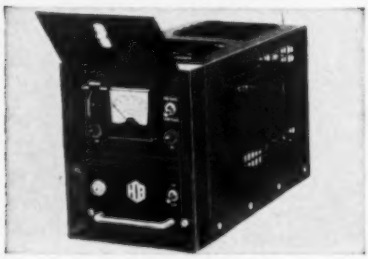
D-C POWER SOURCE [*H. O. Boehme, Inc.*]

For Communications Equipment



Through a front panel switching system Model 10-C power supply provides a constant 115 vdc output at load currents up to 3 amp.

The unit accepts input voltage sources of 115 ±10 v and 230 ±20 v, single phase, 25 to 60 cps.

This supply produces a d-c voltage with low a-c ripple and consists of the following components: a power transformer; a full wave bridge rectifier assembly, consisting of four silicon rectifiers; a swinging choke; a 1,000 μf capacitor; two bleeder resistors.

Each silicon rectifier is mounted on its own individual copper cooling fin.

The device is suitable as a power source for fractional hp d-c motors and tape pullers.

Maximum overall dimensions are 9½" h by 7⅜" w by 18" d. The supply weighs 50 pounds.

PRICE: $435.00. **AVAILABILITY:** 90 days. **MFR:** H. O. Boehme, Inc., 915 Broadway, Dept EP, New York 10, N. Y. **SALES MGR:** J. H. Ringhoff, SP 7-2208; for nearest rep see **eem** p. 1665 (1961-62 Ed.)

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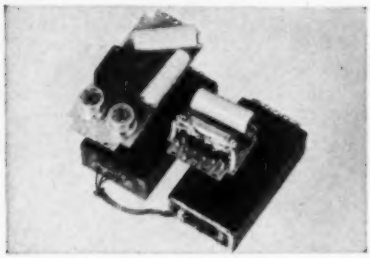
FLOATING D-C/D-C CONVERTER [*United ElectroDynamics, Inc.*]

One-Cubic-Inch Unit Has 70% Efficiency



Isolated power supply Model PC-34 converts grounded 28 vdc to fully floating and filtered ±12 v, ± 9 v dc, with more than 70% efficiency at 1.5 watts.

Capacitance coupling of the output to ground is less than 30 pf. Unbalanced voltage coupling to the secondary common is less than 300 μv p-p per kilohm to ground at a nominal frequency of 6.4 kc. This is analogous to common mode rejection of 100 db.

A basic 28-v inverter module supplies square waves to a transformer in the isolator modules. A single inverter drives up to four isolators, depending on the loads.

Inputs from 12 to 40 vdc are available and other outputs are also available.

These 1-cubic-inch modules operate over an ambient temperature range from −40°C to 125°C.

PRICE: Contact Sales Offices below. **AVAILABILITY:** Stock to 3 wks. **MFR:** United ElectroDynamics, Inc., 200 Allendale Rd., Dept EP, Pasadena, Calif. **SALES OFFICES:** See **eem** p. 1867 (1961-62 Ed.)

Check **204** *Reader Service Card 11/61*

CONSTANT VOLTAGE AND/OR CURRENT POWER SUPPLY [*NJE Corporation*]

Features Automatic Electronic Changeover

For forming and aging electrolytic capacitors, this power supply can operate at either constant voltage with adjustable current limiting or constant current with adjustable voltage limiting.

While operating with constant voltage, Model CVC-300-6 has an output range of 2 to 300 v and 0 to 6 amp. Its regulation for both line and load is ±0.1%.

At constant current, the output range is 0 to 300 v and 0.3 to 6 amp. Line regulation and load regulation are ±0.1%.

Input voltage is 230 v single phase, 60 cycles and ripple rms is 2.0% or 0.2 v rms (whichever is greater).

Either positive or negative terminals can be grounded to the chassis, and the entire supply floated 500 v (peak) above or below chassis ground.

The unit is designed for continuous duty.

PRICE: $3,780.00. **AVAILABILITY:** Contact Sales Offices below. **MFR:** NJE Corp., 20 Boright Ave., Dept EP, Kenilworth, N. J. **SALES OFFICES:** See **eem** p. 1792 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1207, 1221

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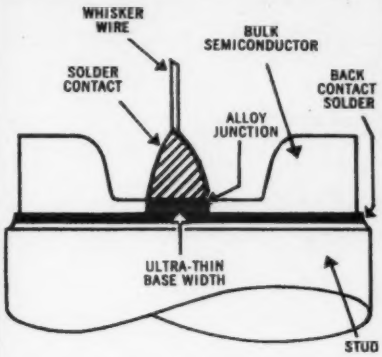
PHILCO ANNOUNCES INDUSTRY'S

FIRST GERMANIUM VARACTORS



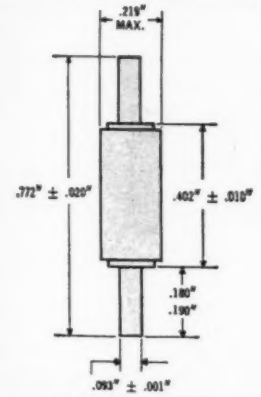
Philco Germanium Microetch construction creates an ultra-thin base width (shown in red). Result: higher breakdown voltage for a given cutoff frequency . . . and greatest capacitance variation.

New Philco varactor types L-4110, L-4111, and L-4112—industry's first germanium varactors—herald new capabilities for harmonic generators, parametric amplifiers, RF tuning devices, and a wide variety of all-solid state power sources.

(Philco Germanium Microetch process, heart of the new varactor capability, combines with the low contact potential inherent in germanium to produce large capacitance variation. And large capacitance variation means more efficient frequency conversion — the capability that makes the varactor ideal for harmonic generators.

Originally designed for Philco's own all-solid state power sources, these varactors now are commercially available for your own designs.

DIMENSIONAL OUTLINE AND MECHANICAL SPECIFICATIONS



OUTSIDE DIMENSIONS

PHILCO GERMANIUM VARACTORS

Parameters	L-4110	L-4111	L-4112
Max. Power Dissipation	0.4 watts	0.3 watts	0.2 watts
Breakdown voltage (minimum at −200 μa)	80 volts	40 volts	20 volts
Junction capacitance (at 100 kc and varactor biased at ⅓ V_b)	1.0-2.0 pf	0.35-0.7 pf	0.17-0.35 pf
Series resistance (typical; measured at 2 Gc and varactor biased at ⅓ V_b)	5 ohms	6 ohms	7 ohms
Cutoff frequency (minimum; calculated at ⅓ V_b)	25 Gc	60 Gc	100 Gc
Lead inductance (typical; measured at 2 Gc)	0.4 nhy	0.4 nhy	0.4 nhy
Cartridge capacitance (typical; measured at 100 kc)	0.2 pf	0.2 pf	0.2 pf

These interesting new microwave items
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VOLTAGE-TO-FREQUENCY CONVERTERS [*Pioneer Magnetics Inc.*]

eem File System Sec. 4000 electronic engineers master

Weight Under 12 Ounces — 2 5/16" x 2 1/16" x 3 1/8"

Containing no moving parts or vacuum tubes, the Falcon-Magaverter line of voltage-to-frequency converters convert 0-5, 0-10, 0-100, and 0-1,000 vdc into a pulse or square-wave output. Output frequency varies linearly with the d-c input signal from approximately 0 cps to the preset full-scale frequency.

Four standard models give full-scale output frequencies of 500 to 4,000 cps. Each unit has an attenuator for ±20% adjustment of the full-scale frequency.

Standard units offer linearity and accuracies of 1%. Red Line units are available with 0.1% linearity and 50ppm/°C temperature sensitivity.

Standard operating temperature range is from −50°C to 50°C; special units are available for operation to 80°C.

PRICE: $250.00 to $350.00. **AVAILABILITY:** 30 to 60 days. **MFR:** Pioneer Magnetics Inc., 850 Pico Blvd., Dept EP, Santa Monica, Calif. **SALES MGR:** S. Gindoff, EX 9-9292; for nearest rep see **eem** p. 1811 (1961-62 Ed.)

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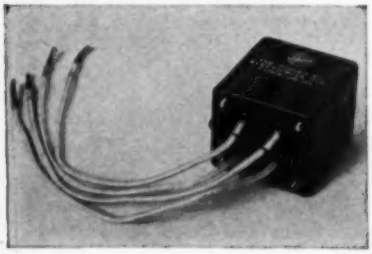
SOLID-STATE POWER CONVERTER [*The Hoover Co. Electronics Div.*]

Efficiency Greater Than 75% — 0.1 VDC Input Units Available



With an efficiency of greater than 75%, this power converter is designed for battery-charging applications in conjunction with thermoelectric generators, fuel cells, or low voltage batteries.

Model DPC-113 has an input of 1.5 vdc (10 watts) and an output of 15 vdc; available on special order are units with other input and output amplitudes, some with inputs as low as 0.1 vdc and either a-c or d-c outputs.

An increase in efficiency is obtained with an increase in input voltage amplitude; with 6-v input, the efficiency is over 90%.

The device is non-dissipative, and will not discharge the battery when the charging source is disconnected or inoperative.

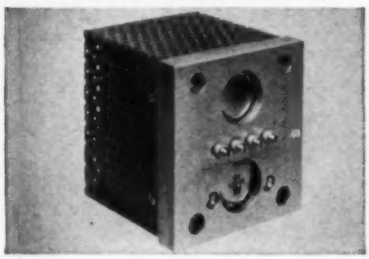
Weighing 1¾ lb, the converter is 3" h, 2 15/16" w, and 2 9/16" d.

PRICE: $60.00 to $100.00. **AVAILABILITY:** 6 to 8 wks. **MFR:** The Hoover Co., Electronics Div., P. O. Box 181, Dept EP, Baltimore 3, Md. **SALES MGR:** A. J. W. Novak, CL 2-4000; for nearest rep see **eem** p. 1749 (1961-62 Ed.)

Check **207** *Reader Service Card 11/61*

D-C TO A-C SINE-WAVE INVERTERS [*Raytheon Co., Sorensen Products*]

Transistorized — Silent Operation



Six QIS 60-cycle models and six DQIS 400-cycle models comprise this line of miniature 115-volt a-c to d-c sine-wave inverters.

Operating from 12 or 28-vdc inputs, the units' outputs, obtained from class B amplifiers, are 20, 40, or 60 watts.

These power supplies are free of radio-frequency noise and are practically devoid of audio noise.

Line voltage regulation is ±1% and load regulation is ±3%; frequency regulation line and load combined is ±0.5%. Typical efficiency at full load is 48%.

Supplies can be rack mounted and their net weights range from 2½ to 8 pounds.

Beside vibrator-supply replacement; other application areas include tape motors, small magnetic amplifiers and gyros.

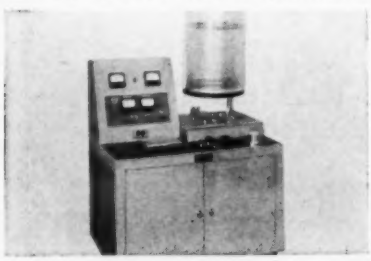
PRICE: $190.00 to $200.00. **AVAILABILITY:** From stock. **MFR:** Raytheon Co., Sorensen Products Dept EP, South Norwalk, Conn. **SALES OFFICES:** See **eem** p. 1823 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1546

Check **208** *Reader Service Card 11/61*

HIGH-VACUUM BELL-JAR EVAPORATOR [*Vacuum Specialties, Inc.*]

eem File System Sec. 4100 electronic engineers master

Permits View Of Work And Instruments From Single Position



Model VSC-20 bell-jar thin-film coating system is contained in a 32-inch desk console.

This 18-inch diameter unit is operated by an electric hoist which raises and lowers the jar and its steel safety shield.

The vacuum pumping system employs a power-operated main valve that seats directly on the baseplate minimizing the system volume exposed to the atmosphere during batch cycling.

The entire unit exhausts to 20 x 10^{-5} mm in 30 minutes.

Applications include laboratory use and small parts production coating in the electronics, optics, infrared, and semiconductor fields.

The chamber is capable of simulating altitudes up to 120 miles for environmental testing.

PRICE: $4,500.00. **AVAILABILITY:** 6 to 8 wks. **MFR:** Vacuum Specialties, Inc, 34 Linden St. Dept EP, Somerville, Massachusetts. **SALES MGR:** J. H. Durant, MO 6-5450; for nearest rep see **eem** p. 1870 (1961-62 Ed.)

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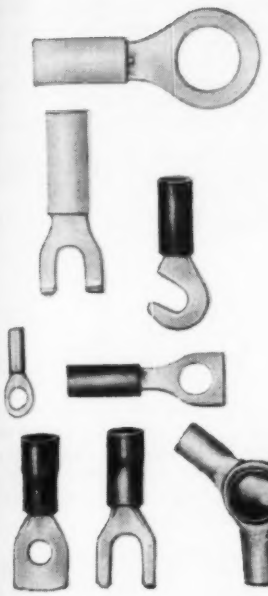

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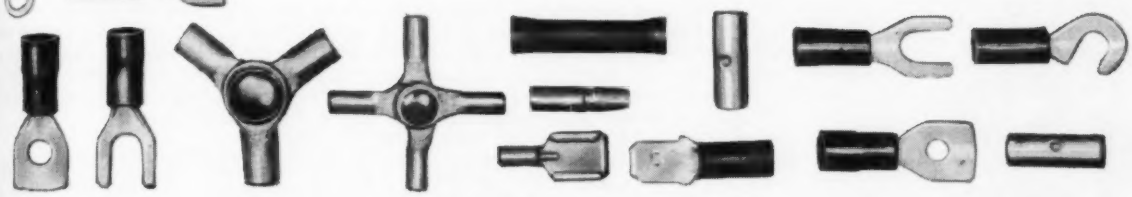

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This lamp signals the need for its own replacement!

The failure of a signal or indicator lamp can be serious—even tragic. ***Because of their complete reliability Chicago Miniature Lamps have earned widespread preference for use as signal lamps in vital military and industrial applications.***

Now, however, Chicago Miniature's lamp engineers have taken another step to insure ***reliable*** performance. They have designed a double filament lamp in which one filament serves as the principal light source;—the second is long lived! When the first filament burns out, the second continues to operate, performing its function as a signal lamp, but with reduced candlepower,—a warning that replacement is necessary.

This is just one more example of Chicago Miniature's many contributions to product reliability. For more complete information write for data on double filament lamps,—now available in several styles and sizes.

Write for Bulletin 1105—Miniature Lamp Data Book

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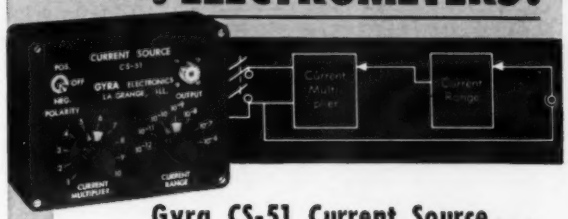
Calibrated Current Source for testing ELECTROMETERS!



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offers a convenient method of verifying ELECTROMETER calibration . . . **essential for accurate Gas Chromatography** and other applications of ELECTROMETERS! Provides 70 accurately calibrated increments of current between 1 $\mu\mu$a and 10 μa for checking the electrometer input tube sensitivity, (which may have been overloaded with resultant loss of emission on a preceding application) thermal drift and other causes of calibration deviations. Current is derived from self-contained mercury cells. **Write for Gyra CS-51 Bulletin No. 700.**

Other products of Gyra Electronics Corporation are Electrometers, and stabilized power supplies for laboratory research.

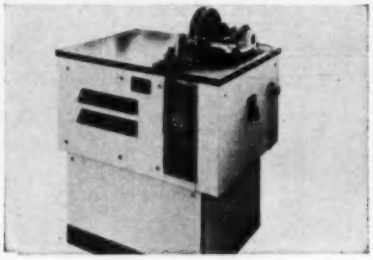
Gyra ELECTRONICS CORPORATION
P.O. Box 184-E1 **Phone: FLeetwood 4-4644** **LaGrange, Illinois**

Check **64** *Reader Service Card*

SOLID DIE DOUBLE STROKE COLD HEADER [*REM Sales, Inc.*]

eem File System Sec. electronic engineers master 4100

Variable Speed Drive Allows Adjustment While Operating



Model "OO" solid die double stroke cold headers feature adjustable fly wheel speed by turning a dial. This speed is adjustable between 150 and 300 rpm, thus permitting changes after a job is set up.

With a wire diameter capacity from 0.012" to 0.070", this unit was developed for the manufacture of tiny components such as electrical contacts, optical screw blanks and miniature rivet forms. A special die block and mechanism included with the machine allows hollowing of soft materials.

The cold header is built into a desk-type cabinet base having tool storage drawers and work-receiving pans. The motor drive is housed in the cabinet, supported by a metal framework. The machine is provided with a one-shot lubricating system.

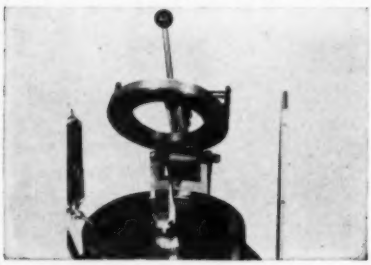
Single-stroke model for heading balls up to 0.0625" finished size is available.

PRICE: $4,500.00. **AVAILABILITY:** 8 wks. **MFR:** REM Sales, Inc., P.O. Box 41, Dept EP, West Hartford, Conn. **SALES MGR:** R. E. Morris, AD 3-3663

Check **300** *Reader Service Card 11/61*

SEMICONDUCTOR POLISHING MACHINES [*Dallons Laboratories, Inc.*]

Provide 0.5 Micron Mirror Finish, Parallelism To 0.000005"



Two precision planetary polishing machines for semiconductor processing, provide a mirror finish in the order of 0.5 micron. They are said to produce a degree of flatness and parallelism never before attainable. Machines will produce a mirror-like finish on one face of very thin semiconductor wafers, and will polish both faces of heavier slices simultaneously.

Model PPM-2875B features a wide 2⅞" track with a capacity of 10 carriers, each with a capacity of from six ½" to one 1¾" slices. Model PPM-1875B has a 1⅞" track and will hold 17 carriers, each with a capacity from three ½" slices to one 1" slice.

A master control panel contains all controls for the variable speed motor, slurry mixer, and coolant pump.

PRICE: $3,000.00. **AVAILABILITY:** From stock. **MFR:** Dallons Laboratories, Inc., 5066 Santa Monica Blvd., Dept EP, Los Angeles 29, Calif. **SALES MGR:** J. T. Cataldo, NO 4-1951; for nearest rep see **eem** p. 1692 (1961-62 Ed.)

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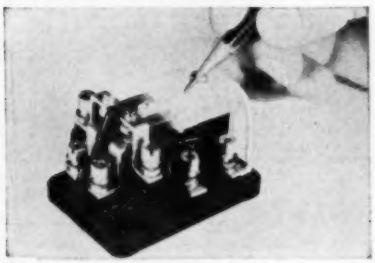
MULTI-POLE RELAYS [*Ward Leonard Electric Co.*]

eem File System Sec. electronic engineers master 4500

For A-C And D-C Circuits



Available in 2, 3 or 4pdt versions, the Nyline standard open type relays have molded phenolic insulating bases and screw terminals for front connection. All units can be equipped with coils for operation to 230 vac and 115 vdc. Self-aligning, the silver-to-silver contacts are rated at 10 amp non-inductive, 250 volts. The 4-pole relay measures 2⅝" x 3⅛" x 1²⁹⁄₃₂" high.

A nylon contact finger support insures full electrical spacings and simplifies contact replacement. Flexible silicone insulated leads make connection between leaf spring contact fingers and terminals.

Relays equipped with plug-in receptacles require additional pin-plug type base assemblies. Plug-in mounting is available on 2- or 3-pole versions.

PRICE: $21.20 list (4pdt). **AVAILABILITY:** From stock. **MFR:** Ward Leonard Electric Co., 85 South St., Dept EP, Mt. Vernon, N. Y. **SALES OFFICES:** See **eem** p. 1877 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1369

Check **302** *Reader Service Card 11/61*

SUBMINIATURE ROTARY RELAY [*Couch Ordnance, Inc.*]

For Military Use Under Extreme Environmental Conditions

Type 4D relay is a hermetically sealed 4pdt d-c unit with a balanced armature rotary motor. The contacts are capable of switching both high and low power levels interchangeably.

Environmental features include: ambient temperature, −65°C to 125°C; vibration, 10 to 3,000 cps; acceleration, 50 g's; mechanical shock, 500 g's; electrical shock, 100 g's for 11 msec. Insulation resistance is 1,000 megohms; dielectric strength is 1,000 v rms.

At 25°C the d-c coil pull-in power is 0.5 watt. Duty cycle is continuous. Contact arrangement is 4 form C. Contact resistance is 0.02 ohm max (100 mv at 5 amp dc) and the resistive load rating is 5 amp at 30 vdc. The unit weighs 3.2 oz and is 1³⁄₃₂" in diameter by 1½" high.

PRICE: $25.00 approx (1-24). **AVAILABILITY:** 6-10 wks. **MFR:** Couch Ordnance, Inc., 3 Arlington St., Dept EP, North Quincy 71, Mass. **SALES MGR:** B. Gray, CY 8-4147; for nearest rep see **eem** p. 1689 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1273

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ELECTRONIC PRODUCTS stands alone. It is the only electronic magazine serving the industry that specializes in NEW PRODUCT data exclusively — the building block of the electronics industry. Some publications restrict new product information to a column or so; others limit it to a department. ELECTRONIC PRODUCTS devotes its complete editorial to new products and their applications . . . the most dynamic requirement of electronic engineers and p.a.'s.

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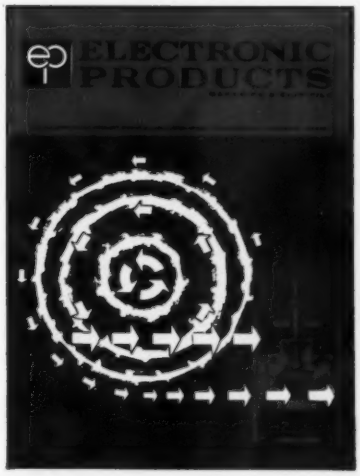

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DRY REED RELAY [*Magnecraft Electric Co.*]

eem File System Sec. 4500

Contact Resistance 50 Milliohms Maximum

Fast switching, highly stable contact resistance, and long life are combined in this spdt reed-type relay.

The entire switch element of Magnereed Class 103 is hermetically sealed into a glass capsule in an atmosphere of inert gas. The gold contacts are actuated magnetically by a coil around the glass switch capsule. This relay is adaptable to numerous mechanical configurations.

Preadjusted contacts are rated 10 watts resistive load, 1 ampere or 250 vac max.

Both operate time and release time are less than 1 millisecond, not including bounce time.

The unit's dimensions are: coil 2⅛" long, ½" diameter; overall length including leads is 3½".

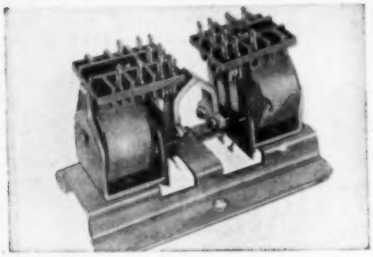
Relays for operation with 32, 23, 14.5, 10, and 4.6 ma are available.

PRICE: $7.80 to $9.96 (single unit). **AVAILABILITY:** From stock. **MFR:** Magnecraft Electric Co., 3354R West Grand Ave., Dept EP, Chicago 51, Ill. **SALES MGR:** John Diemel EV 4-6868; for nearest rep see eem p. 1776 (1961-62 Ed.)

Check **304** *Reader Service Card 11/61*

LATCHING RELAYS [*Elgin National Watch Co.*]

General Purpose Units—Two Moving Parts



Available in a variety of a-c and d-c coil voltages, these electrical latch/reset, lightweight relays have latching mechanisms with only two moving parts. Type LGA has a 5 amp contact rating and type LGB has a 10 amp contact rating.

Nominal operating power is 2 to 3 w for the d-c unit and 3 to 4 va for the a-c unit.

Other specifications include: mechanical life expectancy 500,000 operations; temperature range, when specified —55°C to 85°C.

The relays' dimensions are 3.03" l, 1.59" w and 1.88" h. Weight is 5 oz max.

Contact arrangements offered are spdt (1C), dpdt (2C), and 3pdt (3C).

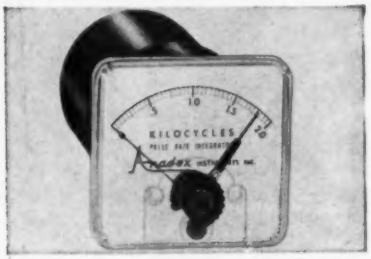
Dielectric strength is 500 v rms between nonconnected teminals and between terminals and ground for 1 sec.

PRICE: $7.00 to $10.00 (depending on requirements). **AVAILABILITY:** From stock. **MFR:** Electronics Div., Elgin National Watch Co., 2435 N. Naomi St., Dept EP, Burbank, Calif. **SALES MGR:** D. C. Manning, VI 9-1446; for nearest rep see eem p. 1639 (1961-62 Ed.) **OTHER PRODUCTS:** See eem p. 1276

Check **305** *Reader Service Card 11/61*

FREQUENCY METER RELAY [*Anadex Instruments, Inc.*]

For Use With Flowmeters, Tachometers And Radiation Detectors



Used for preselecting frequencies to actuate external controls, this frequency meter relay combines in one package a frequency converter and a meter relay.

The instrument is available in two types. One is a continuous reading type where the meter continues to read past the set point to full scale. The other model is a locking type in which the meter stops reading at the set point and will not reset itself until the frequency signal returns to the set point.

Standard full-scale frequencies available range from 50 kc down to 50 cps.

The meter relay has an input sensitivity of 10 mv rms and an accuracy of 1%.

Standard meter sizes are 2½" wide, 3½" wide and 4½" wide.

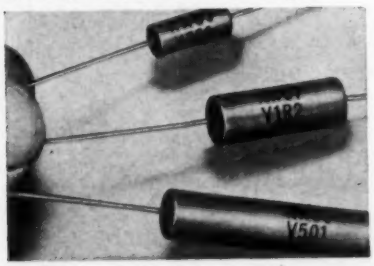
PRICE: From $125.00 ea. **AVAILABILITY:** 30 days. **MFR:** Anadex Instruments, Inc., 14734 Arminta St., Dept EP, Van Nuys, Calif. **SALES MGR:** W. Caldwell, TR 3-4580; for nearest rep see eem p. 1649 (1961-62 Ed.)

Check **306** *Reader Service Card 11/61*

MOLDED WIREWOUND RESISTORS [*Ohmite Mfg. Co.*]

eem File System Sec. 4700

Meet Insulated MIL-R-26C Styles



Three MIL-R-26C axial-lead, power resistor styles, recently established by the Armed Services Electro Standards Agency (ASESA), are designated RW67, RW68 and RW69. This firm's Riteohm 88 molded, wirewound, axial-lead resistors meet these MIL requirements.

Dimensionally, the new styles are the same as Styles RW57, RW58, RW59, but are insulated versions.

Units exceed the 1 kv ac requirement of the V-block dielectric strength test and also exceed MIL requirements with a temperature coefficient of resistance of 0±20 ppm/°C. A standard resistance tolerance of 3% rather than the MIL standard of 5%, is furnished at no extra charge.

Resistors are wirewound on a ceramic core fitted with metal end-caps.

PRICE: $0.36-$0.57 (qty of 250-499; depending on wattage and resistance). **AVAILABILITY:** From stock. **MFR:** Ohmite Mfg. Co., 3636 Howard St., Dept EP, Skokie, Ill. **SALES OFFICES:** See eem p. 1801 (1961-62 Ed.) **OTHER PRODUCTS:** See eem pp. 1342, 1343.

Check **307** *Reader Service Card 11/61*

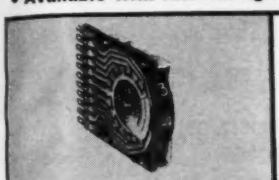
THUMBWHEEL SWITCHES

TABET U.S. Patent: 3,141,660

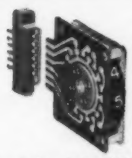
Binary & Digital

C·D·I

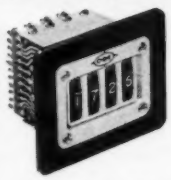
- **For Critical Reliability Applications.**
- **Available with internal lighting MIL-L-25467A.**



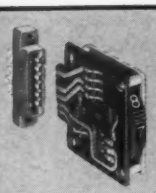
Permanent wafer type, Series TSD-P. Only ½" panel space needed per module. Also available in multi-deck series TM.



Removable wafer type, Series TSD-R. For continuous operation applications where interruptions must be held to an absolute minimum.



Permanent wafer type, Series TSB-P. Available in 8, 10, 12 or 16 positions, up to 36 switches per assembly.



Removable wafer type, Series TSB-R. For applications where maintenance time is valuable and rapid servicing a necessity.

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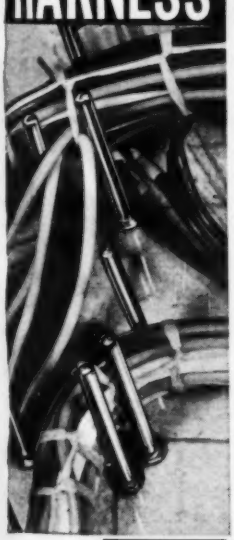

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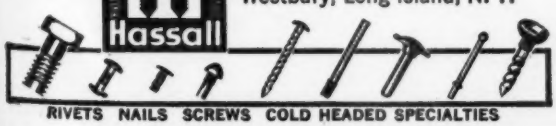

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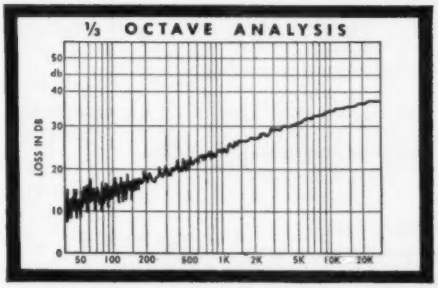
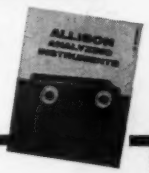
Allison Transistorized Noise Sources with Uniform Spectral Density —5 cps to 30 kcps

Here's the ideal noise source for shaker tables, high-level environmental acoustic testing, and other applications requiring a uniform output of a random (white) noise. Allison Noise Sources are all solid state devices. They are non-microphonic and can be used in areas of high ambient noise and vibration. The Allison 650 is a small, lightweight portable instrument, battery or AC powered, from $265.00 up; the Allison 655 is a miniature, welded and incapsulated unit, 1" x 1¾" x 1⅝", $36.00 in 100 lots. Write today for spectrum curves, complete specifications, and prices.



FREE LITERATURE! *Clip coupon, attach to company letterhead, and mail today for literature on noise sources.*



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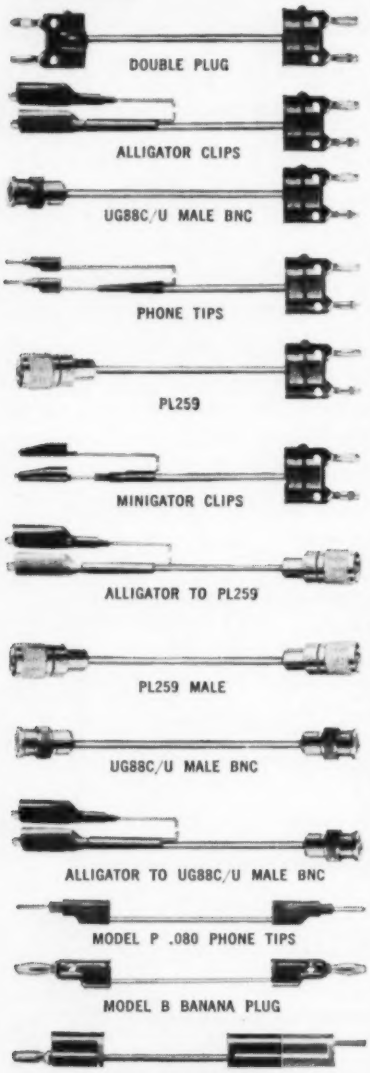

SEND FOR FREE GENERAL CAT. 6-61

REFER TO 1961-62 EEM

POMONA Electronics CO INC

1500 East Ninth Street, Pomona, California

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NEW PRODUCT LITERATURE

DATA FILE — Sec. 1400

A technical data file for radio-frequency designers contains nine data sheets of general information and technical data on electronic weatherstrip, combo strip, compressed r-f gaskets, combination gaskets, metalastic gaskets, knitted mesh, and special r-f strip. *Metex Electronics Corp., 50 Walnut Ave., Dept EP, Clark, N. J.*

Check **215** *Reader Service Card*

MICA CAPACITORS — Sec. 1500

Described in 18-page bulletin 318.2 are 90 variations of resin-sealed button-mica capacitors. The capacitors' design features make them useful for vhf and uhf applications in the temperature range of −55°C to 85°C. *Erie Resistor Corp., 644 West 12th St., Dept EP, Erie, Penna.*

Check **216** *Reader Service Card*

DUAL-DIELECTRIC CAPACITORS — Sec. 1500

Engineering bulletin 2004A gives current dimensions and performance characteristics for capacitors combining polyester film, Kraft paper and a solid impregnant. Type 220P Orange Drop capacitors utilize the Difilm system of dielectrics. *Sprague Electric Co., Dept EP, North Adams, Mass.*

Check **217** *Reader Service Card*

DIGITAL SHAFT-ANGLE ENCODERS — Sec. 2000

An eight-page catalog contains specifications and technical descriptions of linear and sine-cosine precision optical encoders for converting angular position information into binary code. Also included are encoder principles of operation, applications, packaging features, and relationship between disc coding and degree of accuracy. Auxiliary test sets and power supplies are described. *Computer Control Co., Inc., 983 Concord St., Dept EP, Framingham, Mass.*

Check **218** *Reader Service Card*

SHAFT POSITION ENCODERS — Sec. 2000

Electrical and mechanical specifications for high precision shaft position encoders for conversion of angular shaft displacement into electrical form are available in an illustrated four-page bulletin. *AR&T Electronics, Inc., Sub. of Baldwin Piano Co., 1101 McAlmont St., Dept EP, Little Rock, Ark.*

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DIGITAL MODULES — Sec. 2000

Plug-in digital modules are described in a 12-page catalog. Specifications, auxiliary equipment for modules, magnetic core memories, and testers designed to supplement system installations are included, along with prices and discount schedules. *Computer Control Company, Inc., 983 Concord St., Dept EP, Framingham, Mass.*

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DIGITAL HANDBOOK — Sec. 2000

Titled "Digital Application Notes", a 68-page handbook covering applications of digial circuitry, includes chapters on basic logic design principles, graphic symbols, logic modules, and circuit configurations. Diagrams of the new logic symbols now in use as outlined by MIL-STD-806 (USAF) are also included. *Interstate Electronics Corp., 707 East Vermont Ave., Dept EP, Anaheim, Calif.*

Check **221** *Reader Service Card*

PATCH CORDS — Sec. 2100

Patch cords suitable for use in computers and other electronic components are listed in this 60-page catalog. Cords are said to permit inter-connection of large numbers of multiple circuits in confined space. *Herman H. Smith, Inc., 2326 Nostrand Ave., Dept EP, Brooklyn 10, N. Y.*

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(Continued on Page 75)

eem File System | Sec. 2900
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		03103	03303	03503	RED
ndard Alligator Clip Both Ends	PRICE EACH	$ .49	$ .67	$ .85	
	PART NO.	21121	21321	21521	BLACK
		23123	23323	23523	RED
iature Alligator Clip Both Ends	PRICE EACH	$ .49	$ .67	$ .85	
	PART NO.	51151	51351	51551	BLACK
		53153	53353	53553	RED
Plug Both Ends	PRICE EACH	$ .89	$1.07	$1.25	
	PART NO.	31131	31331	31531	BLACK
		33133	33333	33533	RED
nana Plug Both Ends	PRICE EACH	$ .79	$ .97	$1.15	
	PART NO.	81181	81381	81581	BLACK
		83183	83383	83583	RED
ade Lug Both Ends	PRICE EACH	$ .69	$ .87	$1.05	
	PART NO.	01151	01351	01551	BLACK
		03153	03353	03553	RED
andard Alligator Clip to Pin Plug	PRICE EACH	$ .69	$ .87	$1.05	
	PART NO.	01131	01331	01531	BLACK
		03133	03333	03533	RED
andard Alligator Clip to Banana Plug	PRICE EACH	$ .64	$ .82	$1.00	
	PART NO.	01181	01381	01581	BLACK
		03183	03383	03583	RED
andard Alligator Clip to Spade Lug	PRICE EACH	$ .59	$ .77	$ .95	
	PART NO.	51131	51331	51531	BLACK
		53133	53333	53533	RED
n Plug to Banana Plug	PRICE EACH	$ .84	$1.02	$1.20	
	PART NO.	805 (4 feet long)			
Meter Leads—Pair Red and Black	PRICE	$1.19 Per Pair			

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BNC Male Both Ends	PART NO.	5011501	5013501	5015501	RG-58/U
	PRICE EACH	$2.65	$2.95	$3.25	
BNC Female Both Ends	PART NO.	5021502	5023502	5025502	RG-58/U
	PRICE EACH	$3.15	$3.45	$3.75	
Double Plug Both Ends	PART NO.	5081508	5083502	5085502	RG-58/U
	PRICE EACH	$2.65	$2.95	$3.25	
BNC Male to Alligator Clips	PART NO.	5011509	5013509	5015509	LOW CAPACI
	PRICE EACH	$1.77	$2.01	$2.25	
UHF Male Both Ends	PART NO.	5031503	5033503	5035503	RG-11/U
	PRICE EACH	$1.80	$2.40	$3.00	
UHF Male to Alligator Clips	PART NO.	5031509	5033509	5035509	RG-11/U
	PRICE EACH	$1.27	$1.51	$1.75	
BNC Male to Shielded Double Plug	PART NO.	5011S509	5013S509	5015S509	LOW CAPACI
	PRICE EACH	$3.00	$3.24	$3.48	

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	PRICE EACH	$2.66	$2.98	$3.30
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	PRICE EACH	$1.72	$1.86	$2.00

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TYPE	SPECIFICATIONS
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TEST LEAD TERMINATIONS	HIGH VOLTAGE INSULATORS—BRASS, NICKEL PLATED METAL PARTS
COAXIAL CABLE	RG-58/U OR RG-11/U AS SPECIFIED
LOW CAPACITY CABLE	VINYL COVERED, 35 MMFD PER FOOT MAXIMUM, FULLY SHIELDED
BNC CONNECTORS	MALE—UG-88/U * FEMALE—UG-89/U
UHF CONNECTORS	MALE—PL-259
TWISTED PAIR WIRE	2 #18 GAUGE EXTRA FLEXIBLE, 20,000 VOLT INSULATED, IN PVC SLEEVE

TESTING SPECIFICATIONS

PARAMETER	TEST CONDITIONS
CONTINUITY	MEASURED WITH 1 AMP OF DC CURRENT
INSULATION RESISTANCE	FOR SHIELDED LEADS—LEAKAGE WITH 1000 VOLTS DC APPLIED—.005 MA MAXIMUM
DIELECTRIC STRENGTH	FOR SHIELDED LEADS—LEAKAGE WITH 500 VRMS AT 60 CPS—1 MA MAXIMUM
PULL TEST	NO SEPARATION TO OCCUR WITH 5 POUND PULL BETWEEN TERMINATIONS

OTHER MODIFICATIONS AVAILABLE

WIRE & CABLE	ANY AVAILABLE WIRE OR CABLE SUITABLE FOR THE PURPOSE MAY BE SPECIFIED ON SPECIAL ORDER
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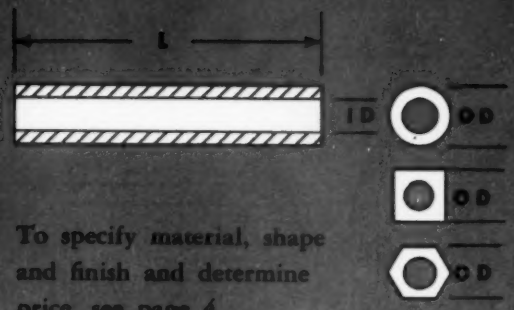
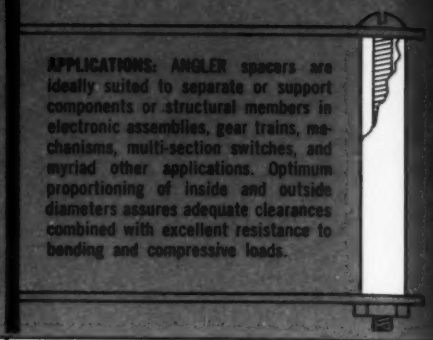
CRIPTION: ANGLER spacers are cision tubular components having cision machined ends and accu- ly controlled lengths. They are ilable with round, square or hexa- al outside diameters, in aluminum, ss, corrosion resistant steel, or d rolled steel. A wide selection of es and a broad choice of protective shes simplifies the selection of right stock spacer for any appli- ion.



To specify material, shape and finish and determine price, see page 4

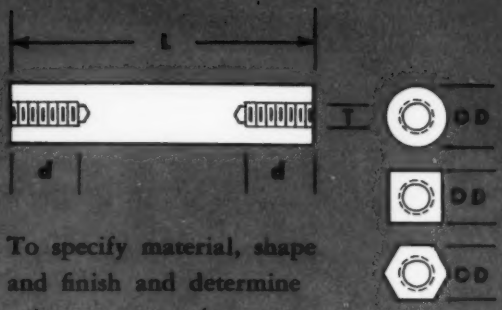
APPLICATIONS: ANGLER spacers are ideally suited to separate or support components or structural members in electronic assemblies, gear trains, mechanisms, multi-section switches, and myriad other applications. Optimum proportioning of inside and outside diameters assures adequate clearances combined with excellent resistance to bending and compressive loads.



ANGLER TYPE	SCREW CLEARANCE	L ±.005 LENGTH	OD ±.005 OUTSIDE DIAMETER	ID ±.008 INSIDE DIAMETER	PRICE FACTOR EACH 100 TO 299
S-100	#4	.125	.250	.124	$.10
S-105	#4	.250	.250	.124	.10
S-110	#4	.375	.250	.124	.10
S-115	#4	.500	.250	.124	.10
S-120	#4	.625	.250	.124	.10
S-125	#4	.750	.250	.124	.10
S-130	#4	.875	.250	.124	.10
S-135	#4	1.000	.250	.124	.10
S-144	#6	.125	.250	.156	.10
S-145	#6	.250	.250	.156	.10
S-150	#6	.375	.250	.156	.10
S-155	#6	.500	.250	.156	.10
S-160	#6	.625	.250	.156	.10
S-165	#6	.750	.250	.156	.10
S-170	#6	.875	.250	.156	.10
S-175	#6	1.000	.250	.156	.10
S-180	#6	1.250	.250	.156	.15
S-185	#6	1.500	.250	.156	.15
S-187	#6	1.750	.250	.156	.15
S-190	#6	2.000	.250	.156	.15
S-191	#8	.125	.250	.180	.10
S-192	#8	.250	.250	.180	.10
S-195	#8	.375	.250	.180	.10
S-200	#8	.500	.250	.180	.10
S-205	#8	.625	.250	.180	.10
S-210	#8	.750	.250	.180	.10
S-215	#8	.875	.250	.180	.10
S-220	#8	1.000	.250	.180	.10
S-225	#8	1.250	.250	.180	.15
S-230	#8	1.500	.250	.180	.15
S-231	#8	1.750	.250	.180	.15
S-235	#8	2.000	.250	.180	.15
S-236	#8	2.250	.250	.180	.20
S-237	#8	2.500	.250	.180	.20
S-238	#8	2.750	.250	.180	.20
S-239	#8	3.000	.250	.180	.20
S-241	#10	.125	.313	.218	.10
S-242	#10	.250	.313	.218	.10
S-243	#10	.375	.313	.218	.10
S-240	#10	.500	.313	.218	.10
S-244	#10	.625	.313	.218	.10
S-245	#10	.750	.313	.218	.10
S-246	#10	.875	.313	.218	.10
S-250	#10	1.000	.313	.218	.10
S-255	#10	1.250	.313	.218	.15
S-260	#10	1.500	.313	.218	.15
S-265	#10	1.750	.313	.218	.15
S-270	#10	2.000	.313	.218	.15
S-275	#10	2.250	.313	.218	.20
S-280	#10	2.500	.313	.218	.20
S-285	#10	2.750	.313	.218	.20
S-290	#10	3.000	.313	.218	.20
S-295	#10	3.250	.313	.218	.20
S-300	#10	3.500	.313	.218	.20
S-305	#10	3.750	.313	.218	.20
S-310	#10	4.000	.313	.218	.25
S-315	#10	4.250	.313	.218	.25
S-320	#10	4.500	.313	.218	.25
S-325	#10	4.750	.313	.218	.25
S-330	#10	5.000	.313	.218	.30
S-335	#10	5.250	.313	.218	.30
S-340	#10	5.500	.313	.218	.30
S-345	#10	5.750	.313	.218	.30
S-350	#10	6.000	.313	.218	.35

POST

APPLICATIONS: ANGLER posts are designed to support and separate components or structural members without the need for long screws or machine nuts. They are ideally suited for application in electronic, electromechanical and mechanical assemblies. Thousands of stock variations of these indispensable components are always available in protoype and production quantities.



To specify material, shape and finish and determine price, see page 4

DESCRIPTION: ANGLER posts are [metallic] rods tapped through, (in shorter lengths), or tapped at [one] end. Threads are Class 2 and [have] suitable lead. All machined edges [are] properly chamfered and debu[rred]. Wide selection of outside sha[pes] round, square or hexagonal. Choice materials; brass, aluminum, corro[sion] resistant steel, or cold rolled ste[el] assures availability of the optim[um] post for any job.

ANGLER TYPE	T—TAPPED BOTH ENDS NC-2B	L ±.005 LENGTH	OD ±.005 OUTSIDE DIAMETER	d—MINIMUM FULL THREAD DEPTH	PRICE FACTO EACH 100 TO 299
P-134	4-40	.500	.250	THRU	$.25
P-135	4-40	.625	.250	THRU	.25
P-140	4-40	.750	.250	.250	.25
P-145	4-40	.875	.250	.250	.25
P-150	4-40	1.000	.250	.250	.25
P-155	4-40	1.250	.250	.250	.25
P-160	4-40	1.500	.250	.250	.25
P-165	4-40	1.750	.250	.250	.25
P-170	4-40	2.000	.250	.250	.30
P-171	4-40	2.250	.250	.250	.30
P-175	4-40	2.500	.250	.250	.30
P-176	4-40	2.750	.250	.250	.30
P-180	4-40	3.000	.250	.250	.30
P-184	6-32	.500	.250	THRU	.25
P-185	6-32	.625	.250	THRU	.25
P-190	6-32	.750	.250	THRU	.25
P-195	6-32	.875	.250	THRU	.25
P-200	6-32	1.000	.250	.375	.25
P-205	6-32	1.250	.250	.375	.25
P-210	6-32	1.500	.250	.375	.25
P-215	6-32	1.750	.250	.375	.25
P-220	6-32	2.000	.250	.375	.30
P-221	6-32	2.250	.250	.375	.30
P-225	6-32	2.500	.250	.375	.30
P-226	6-32	2.750	.250	.375	.30
P-230	6-32	3.000	.250	.375	.30
P-231	6-32	3.250	.250	.375	.30
P-235	6-32	3.500	.250	.375	.30
P-236	6-32	3.750	.250	.375	.30
P-240	6-32	4.000	.250	.375	.30
P-241	8-32	.500	.313	THRU	.25
P-245	8-32	.625	.313	THRU	.25
P-250	8-32	.750	.313	THRU	.25
P-255	8-32	.875	.313	THRU	.25
P-260	8-32	1.000	.313	THRU	.25
P-265	8-32	1.250	.313	.375	.30
P-270	8-32	1.500	.313	.313	.30
P-275	8-32	1.750	.313	.313	.30
P-280	8-32	2.000	.313	.313	.30
P-281	8-32	2.250	.313	.313	.30
P-285	8-32	2.500	.313	.313	.30
P-286	8-32	2.750	.313	.313	.30
P-290	8-32	3.000	.313	.313	.35
P-291	8-32	3.250	.313	.313	.35
P-292	8-32	3.500	.313	.313	.35
P-293	8-32	3.750	.313	.313	.35
P-294	8-32	4.000	.313	.313	.35
P-295	10-24	.500	.375	THRU	.30
P-296	10-24	.625	.375	THRU	.30
P-300	10-24	.750	.375	THRU	.30
P-305	10-24	.875	.375	THRU	.30
P-310	10-24	1.000	.375	THRU	.30
P-315	10-24	1.250	.375	.375	.30
P-320	10-24	1.500	.375	.375	.30
P-325	10-24	1.750	.375	.375	.30
P-330	10-24	2.000	.375	.375	.30
P-335	10-24	2.250	.375	.375	.30
P-340	10-24	2.500	.375	.375	.30
P-345	10-24	2.750	.375	.375	.30
P-350	10-24	3.000	.375	.375	.35
P-351	10-24	3.250	.375	.375	.35
P-355	10-24	3.500	.375	.375	.35
P-356	10-24	3.750	.375	.375	.35
P-360	10-24	4.000	.375	.375	.35

MATERIAL SPECIFICATIONS

TYPE	GOVERNMENT SPECIFICATIONS	COMMERCIAL SPECIFICATIONS
ALUMINUM	QQ-A-365a COMPOSITION 2 TEMPER T3 OR AMS 4080d	2011 - T3 OR 6061 - T6
BRASS	FEDERAL SPECIFICATION QQ-B-626 COMPOSITION 22 TEMPER ½ HARD	ASTM B16 TEMP. ½ HARD OR ASTM B135 ALLOY 3 TEMPER ANNEALED
CORROSION RESISTANT STEEL	FEDERAL SPECIFICATION QQ-S-763 CLASS 303 CONDITION A	AISI 303 ANNEALED
COLD ROLLED STEEL	QQ-S-633 CLASS 2 OR QQ-S-00643	AISI C1213 OR B1113

FINISH SPECIFICATIONS

F-01 BRIGHT NICKEL PLATE QQ-N-290 TYPE V	F-02 CADMIUM PLATE QQ-P-416 TYPE 2 CLASS A
F-03 BLACK OXIDE MIL-F-495	F-05 ANODIZE DYED BLACK MIL-A-8625 TYPE II
F-04 ANODIZE CLEAR MIL-A-8625 TYPE II	F-06 IRRIDITE 14-2 MIL-C-5541
F-07 CLEAR PASSIVATE MIL-P-12011 FINISH 25.01	F-08 BLACK OXIDE MIL-P-12011 FINISH 22.05 GRADE 2
F-09 NONE	F-10 CADMIUM PLATE QQ-P-416 TYPE II CLASS A
F-11 BRIGHT NICKEL PLATE Q-Q-N-290 TYPE II	F-12 ZINC PLATE QQ-Z-235 TYPE II CLASS II

MATERIAL, SHAPE & FINISH SELECTIONS

P-150 - M-05 - F-04 ← TYPICAL COMPLETE PART NUMBER

MATERIAL	CODE	PRICE EXTRA FOR MATERIAL	FINISH	CODE
BRASS * ● ■ ⬢	M-01	MULTIPLY BY 1.0	NONE	F-09
	M-02	MULTIPLY BY 2.0	NICKEL PLATE	* F-01
	M-03	MULTIPLY BY 1.5	CADMIUM PLATE AND IRIDITE	F-02
			CHEMICAL BLACK	F-03
ALUMINUM * ● ■ ⬢	M-04	MULTIPLY BY 1.0	NONE	F-09
	M-05	MULTIPLY BY 2.0	IRIDITE	* F-06
	M-06	MULTIPLY BY 1.5	CLEAR ANODIZE	F-04
			BLACK ANODIZE	F-05
CORROSION RESISTANT STEEL * ● ■ ⬢	M-07	MULTIPLY BY 2.0	NONE	F-09
	M-08	MULTIPLY BY 2.5	BLACK OXIDE	F-08
	M-09	MULTIPLY BY 2.5	PASSIVATE	* F-07
COLD ROLLED STEEL * ● ■ ⬢	M-10	MULTIPLY BY 1.0	NONE	F-09
	M-11	MULTIPLY BY 1.5	CADMIUM PLATE AND IRIDITE	* F-10
	M-12	MULTIPLY BY 1.5	NICKEL PLATE	F-11
			ZINC PLATE AND IRIDITE	F-12

* LARGE STOCK AVAILABLE — ANY LISTED FINISH AT NO EXTRA COST

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FORMULA FOR COMPUTING FINAL PRICE — **EXAMPLE:**

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PRICE EXTRA FOR SMALL QUANTITY	1-9 x 2	10-24 x 1.8	25-49 x 1.5	50-99 x 1.2	100-299 x 1

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1024 Notre Dame St.
Lachine, Quebec, Can.
Melrose 7-1231

NEREM TECHNICAL PROGRAM

(Continued from Page 49)

SESSION 12: (Continued)

12.2: The Human as an Element in System Reliability
J. Spiegel, The Mitre Corp., Lexington, Mass.

12.3: Maintainability and Material Support Costs
R. I. Moeller, IBM Space Guidance Center, Oswego, N. Y.

12.4: Weapons System Design and Supportability — A Function of Failure Prediction
V. J. Taylor, USAF Headquarters, Washington, D. C.

Commonwealth Armory (Marriott Hall)
2:30 - 5:00 P.M.

SESSION 13: Superpower Microwave Tubes

Chairman: J. S. Burgess
Rome Air Development Center, Griffis Air Force Base, N. Y.

13.1: Linear Beam Devices
T. D. Sege, Sperry Gyroscope Co., Great Neck, L. I., N. Y.

13.2: The Cross-Field Approach to Microwave Super-Power
W. C. Brown, Raytheon Company, Burlington, Mass.

Somerset Hotel (Louis XIV Ballroom)
2:30 - 5:00 P.M.

SESSION 14: Radio Astronomy II

Chairman: P. Rizzi
Microwave Technology, Inc., Waltham, Mass.

14.1: A Broad-Band Interferometer for Studies of Discrete Radio Sources
J. N. Douglas, Yale University Observatory, New Haven, Conn.

14.2: Mills Cross and Related Pencil-Beam Antennas
G. Swarup, Stanford University, Stanford, Calif.

14.3: Electronically Scanned Radio Telescopes
I. M. Faigen, Chu Associates, Harvard, Mass.
S. J. Goldstein, Jr., Harvard College Observatory, Cambridge, Mass.

14.4: The Design of Radio Astronomy Instruments
H. G. Weiss, MIT Lincoln Laboratory, Lexington, Mass.

14.5: Report on the 1000-foot Spherical Reflector Antenna
P. Blacksmith and E. L. Bouche
Air Force Cambridge Research Center, Hanscom Field, Bedford, Mass.

(Continued on Page 70)

L&R ULTRASONIC CLEANING SOLUTIONS

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SMITH

NEW PRODUCTS!

ALLIGATOR CLIPS
Insulated, non-insulated types, with screw or solder connection, in steel, copper or brass. UNIQUE SMITH FEATURE: THE TEETH MESH ALL AROUND!

STACK BANANA PLUG
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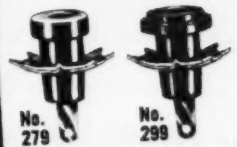
Red or black polystyrene body. Mates with standard dual binding post, ¾" centers. Polarity indicated. Can be stacked for multiple connections.

SLIM PHONE PLUGS
Bakelite or Metal Barrel, available in 2 or 3 circuit types. New "turret-center" design for easy assembly, non-shorting connections.

"SPEEDI-MOUNT" TIP JACKS



Molded bakelite, red or black. Small head and large head types. Unusual dished lockwasher permits fast assembly.

"SPEEDI-MOUNT" BANANA JACKS

Small head and large head types, in red or black molded bakelite. Dished lockwasher, has teeth which embed into jack and panel.

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For easy splice of resistor capacitor and other component leads. Wires insert in tapered ends of "cleap", soldered, for neat permanent connection.

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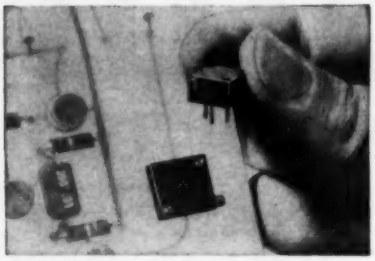
Check **73** *Reader Service Card*

PRINTED CIRCUIT TRIMMER POTENTIOMETERS [*Spectrol Electronics Corp.*]

eem File System Sec. 4700 electronic engineers master

Humidity Proof Units Have Internal Retainer For Adjusting Screw



Trimmer potentiometers type 50-4-1 and 60-4-1, ⅜" and ½" square, are fitted with base pins for printed circuit applications. Units are humidity proof in compliance to MIL-STD-202A and MIL-E-5272C.

The rectangular cross-section resistance element has greater surface contact with the case, providing better heat dissipation. Dual wiper design guarantees positive contact under all conditions of shock and vibration.

Type 50-4-1 is rated 1 watt at 50°C and is available in resistances from 50 to 50 k ohms. Type 60-4-1 is rated 2 watts and is available in resistances from 50 to 100 k ohms.

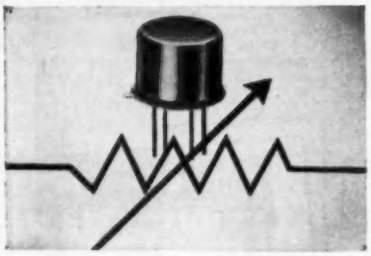
The 25-turn units are said to meet or exceed all applicable military specs for altitude, shock, vibration, fungus, salt spray, humidity, temperature cycling, sand and dust.

PRICE: $8.10 & $7.20 (1-9) **AVAILABILITY:** From stock. **MFR:** Spectrol Electronics Corp., 1704 S. Del Mar Ave., Dept EP, San Gabriel, Calif. **SALES OFFICES:** See **eem** p. 1843 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1348, 1349

Check **308** *Reader Service Card 11/61*

PHOTORESISTIVE POTENTIOMETER [*Raytheon Company*]

Diameter 0.37 Inch, Height 0.26 Inch—Weight 0.4 Ounce



Sealed in a transistor case, the CK1114 Raysistor is a pedestal-free analog switch using an incandescent bulb as the control element and a photosensitive resistor as the signal element.

The control circuit can be driven with 25 mw at 1 v. When illuminated by this power the photosensitive cell changes its resistance value from 3 x 10^8 ohms to 460 ohms. Withstanding up to 60 vdc across its terminals, the signal circuit will dissipate up to 50 mw.

Either a-c or d-c supplies can be used to drive the control circuit and similarly, the signal circuit will switch or vary either a-c or d-c signals.

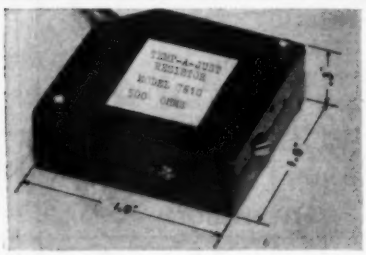
Used as a variable resistance potentiometer or as a long-life switch, the control circuit has a turn-on time of 18 millisec.

PRICE: $8.75 (1-9); $7.15 (10-24); $6.00 (25-100). **AVAILABILITY:** From stock. **MFR:** Raytheon Co., Industrial Components Div., 55 Chapel St., Dept EP, Newton 58, Mass. **SALES OFFICES:** See **eem** p. 1823 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 766, 803, 939, 1293, 1580-1583

Check **309** *Reader Service Card 11/61*

ADJUSTABLE TEMPERATURE COEFFICIENT RESISTOR [*Conrad-Carson Electronics, Inc.*]

Requires No Adjustment Under Repeated Temperature Cycling



Hermetically-sealed Temp-A-Just resistor Model 7610 has a worm gear lead screw adjustment of temperature coefficient over a range of ±10 ppm/°C to ±4,500 ppm/°C.

Standard fixed resistance values are 100, 200, 500, 750, 1K, 1.5K, 2K, 2.5K, 3K, 3.5K, 4K, 4.5K, and 5K ohms. Special resistance values and other temperature coefficient spectrums are available on special order.

Features include: size, 1" x 1" x 0.3"; weight, 11 grams; anodized aluminum housing; operating temperature range, −55°C to 150°C; power dissipation, 1 watt —derated linearly from 125°C to 150°C; resistance tolerance ±5%; withstanding of sand, dust, salt spray, and fungus.

PRICE: $8.75 ea (single unit); $7.75 ea (100). **AVAILABILITY:** 2 to 3 wks. **MFR:** Conrad-Carson Electronics, Inc., P. O. Box 2396 Bostonia Sta., Dept EP, El Cajon, Calif. **SALES MGR:** Scott Linn, HI 2-6691; for nearest rep see **eem** p. 1686 (1961-62 Ed.)

Check **310** *Reader Service Card 11/61*

CONDUCTIVE PLASTIC POTENTIOMETERS [*Fairchild Controls Corp.*]

Temperature Range −65°C To 150°C

Offered in a complete range of sizes from ⅞" to 5" diameter, the Fairite line utilizes a continuous bulk track of conductive, high-impact, heat-resistant plastic which is co-molded with an insulating base of the same material. This combination provides a precision resistance element with high reliability under humidity conditions of 95-100% RH at 71°C and temperature ranging from −65 to 150°C.

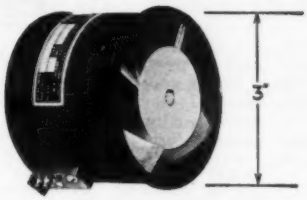
The continuous conductive track provides infinite resolution (less than 0.005°).

Some electrical features include a resistance range from 2,000 to 50,000 ohms (±10%) and a standard linearity of 0.5%. The power rating is 2 watts at 20°C with a −0.0003 to −0.0004 ohm/ohm/°C temperature coefficient.

Minimum life of the units is over 10 million cycles at 600 rpm.

PRICE: & AVAILABILITY: Contact Sales Mgr below. **MFR:** Fairchild Controls Corp., 225 Park Ave., Dept EP, Hicksville, L. I., N. Y. **SALES MGR:** T. D'Andrae, WE 8-5600 Ext 104; for nearest rep see eem p. 1719 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1329, 1505

Check **311** *Reader Service Card 11/61*



NEW 3" BLOWERS a.c. or d.c.

Globe's new 3" diameter VAX-3 vaneaxial blowers combine the ultimate in low weight and small size with high performance at high back pressures.

VAX-3-FC. Designed for 100 cfm. @ 3.5" H_2O back pressure, unit operates on 115 or 200 v.a.c., 400 cycle, 3-phase. Variable speed high altitude units available. Length is 2⅜"; weight is 14 oz. Servo clamp mounting. Designed for MIL specs.

VAX-3-BD. Designed for 80 cfm. @ 1.2" H_2O back pressure, unit operates on 28 v.d.c., but other versions may be wound for up to 115 v.d.c. operation. Length is 3¼"; weight is 16 oz. Servo clamp mounting. Designed for MIL specs.

VAX-3-GN. Same performance as BD version. 115 v.a.c., 60 cycles. Can operate on d.c. also. 3¼" long.

Request Bulletin VAX-3 from Globe Industries, Inc., 1784 Stanley Avenue, Dayton 4, Ohio.

GLOBE INDUSTRIES, INC.

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PINPOINT PRECISION

THROUGHOUT LARGE VOLUME

20" x 20" x 25"

LOWER GRADIENTS:
±1° C. over large portion of test volume

RANGE:
−100° F. to +600° F.

CONTROL ACCURACY:
± ¼° F.

HEATING TIME from 70°:
13 minutes to 350° F.
28 minutes to 500° F.

COOLING TIME from 70°:
6 minutes to −65° F.
9 minutes to −100° F.

Call Delta representative or write direct for specifications

MODEL 1060B
Temperature Chamber
Cabinet Optional

DELTA DESIGN INC.

3163 ADAMS AVE. SAN DIEGO 16, CALIFORNIA
ATWATER 3-3193 • CABLE: DELTA • TWX: SD 6488-U

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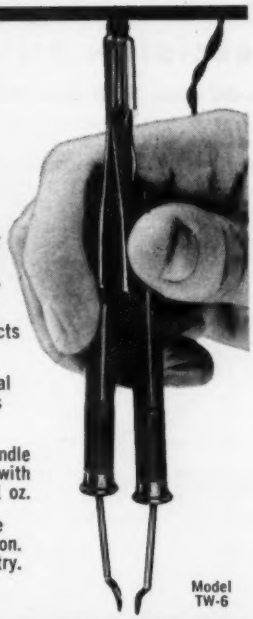
NEW — microminiature

SOLDERING TWEEZERS



operates on 6 V.A.C.-D.C., does the job quicker, better, neater, safer and cheaper . . . on any small, delicate operation such as printed circuits, relays, tag panels, etc.

- **600° TIP TEMPERATURE** simultaneously heats both sides for better joint; protects bi-metals and semi-conductors.
- **COOL TO HANDLE . . .** high grade thermal insulation and elements near tips keeps handles cool.
- **NO OPERATOR FATIGUE . . .** compact handle design permits positive precision work with minimum finger pressure; weighs only 1 oz.
- **LOW VOLTAGE OPERATION** for complete safety and economy in power consumption. Eliminates possibility of shock to circuitry.

$14.95 ea., including 4½' cord.

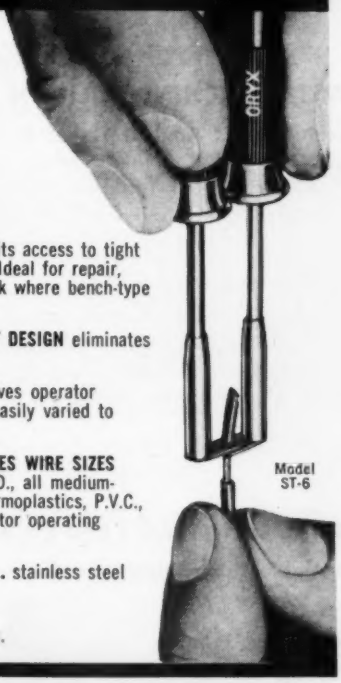
Model TW-6

ORYX precision soldering instruments

. . . products of Oryx Electrical Laboratories Ltd., England, are available through distributors nationally.
(Protected by U. S. Patents)

NEW — miniature

THERMAL WIRE STRIPPER



operates on 6 V.A.C.-D.C., permits access to tight places and speeds production. Ideal for repair, modification and prototype work where bench-type stripper would be unsuitable.

- **LIGHT WEIGHT and COMPACT DESIGN** eliminates operator hand fatigue.
- **UNIQUE TWEEZER ACTION** gives operator complete control; pressure easily varied to prevent conductor damage.
- **ACCOMMODATES WIDE RANGES WIRE SIZES and TYPES:** up to 0.125" O.D., all medium-temperature insulations, thermoplastics, P.V.C., Nylon, rubber, etc. De-insulator operating temperature 480°F.
- **QUALITY CONSTRUCTION . . .** stainless steel blades for long life.

$14.95 ea., including 4¼' cord.

Model ST-6

6-VOLT TRANSFORMER, 18 watts, 3 amps; operates on 110 VAC. ½' cord and instrument clamp holder.

Model 54203-6V **$5.50** ea.

Send for catalog on complete line

THE ORYX COMPANY
13804 VENTURA BOULEVARD, SHERMAN OAKS, CALIFORNIA

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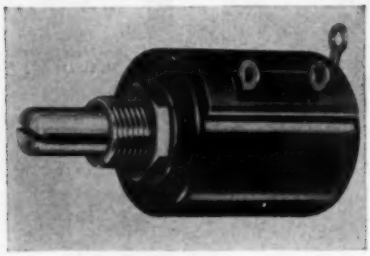
PRECISION POTENTIOMETER [*Bourns, Inc.*]

eem File System Sec. electronic engineers master 4700

Plastic Case, Shaft Seal Provide Humidity Resistance



Offering a 20% longer resistance element in a case ⅞" in dia and 1" long, standard 10-turn potentiometer Model 3500 exceeds steady-state humidity requirements. Units to meet cycling humidity requirements of MIL-STD-202B Method 106 are available.

Standard resistances offered cover the range from 500 to 125K ohms; special resistance values up to 250K are available.

A mechanical life up to 2,000,000 shaft revolutions is claimed because of 100% inspection for wiper and slip-ring pick-off contact pressure of these wirewound units.

Some specifications are: resolution 0.03 to 0.01%; linearity ±0.25% standard; power rating 2 w at 70°C; operating temperature range −65°C to 125°C.

PRICE: Under $10.00 (av qty); 10% premium for cycling humidity performance. **AVAILABILITY:** From stock. **MFR:** Bourns, Inc., 6134 Magnolia Ave., Dept EP, Riverside, Calif. **SALES MGR:** R. C. Archer, OV 4-1700; for nearest rep see eem p. 1666 (1961-62 Ed.) **OTHER PRODUCTS:** See eem pp. 1308, 1309

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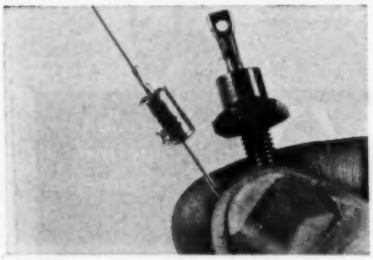
SILICON ZENER VOLTAGE REGULATOR DIODES [*Fansteel Metallurgical Corp.*]

eem File System Sec. electronic engineers master 4800

Nearly 90° Sharp Zener Response, Low Dynamic Resistance



One watt, JEDEC Type 1N3000 series units range from 3-100 ma zener d-c currents at 25°C. Typical test impedances range from 3.5 to 1,500 ohms under 37-1.2 ma test currents. Junction-to-ambient thermal resistance is 100°C/watt approximately.

Ten watt, JEDEC Type 1N2900 series units range from 40-1320 ma zener d-c currents at 25°C. Typical test impedances range from 1.2-300 ohms under 370-12 ma test currents. Junction-to-ambient thermal resistance is approximately 5°C/watt.

Units are available in 6.8 to 200 v ranges with voltage-temperature coefficients of −0.040 to 0.10%/°C. Maximum forward voltage drop is 1.5 volts at 200 ma.

Standard production units have ±20% tolerance, with tolerances of ±10% and ±5% also available.

PRICE: $6.20-$18.00. **AVAILABILITY:** From stock. **MFR:** Fansteel Metallurgical Corp., Rectifier-Capacitor Div., 2200 Sheridan Rd., Dept EP, N. Chicago, Ill. **SALES MGR:** P. Weirich, Ed 6-4900; for nearest rep see eem p. 1719 (1961-62 Ed.)

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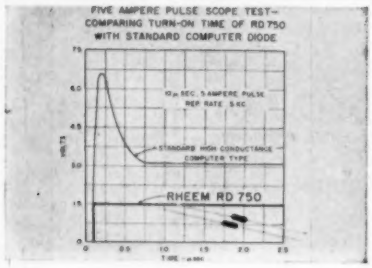
FAST-SWITCHING SILICON DIODE [*Rheem Semiconductor Corp.*]

Conductance 1 Amp At 1 Volt, Recovery Time 10 μsec



With a 5-to-1 improvement in conductance and a 2-to-1 improvement in recovery time, the RD750 silicon diode is said to be superior to previously available units.

Conductance is typically 1,000 ma at one volt, permitting new levels of current switching for applications such as thin-film computer memories. At low current levels the voltage drop is 0.65 volt at 10 ma.

Power dissipation is 750 mw with a DO-7 package size. Reverse recovery time is typically as little as 10 nsec.

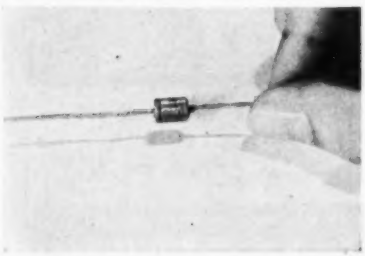
Diode handles low, medium and high current switching jobs, with repetition rates up to 100 mc and current pulses up to 5 amp.

PRICE: $2.65 (100-999) **AVAILABILITY:** From stock. **MFR:** Rheem Semiconductor Corp., 350 Ellis St., Dpt EP, Mountain View, Calif. **SALES OFFICES:** See eem p. 1826 (1961-62 Ed.)

Check **314** *Reader Service Card 11/61*

SILICON RECTIFIERS [*Mallory Semiconductor Co.*]

For Ambient Operating Temperatures To 125°C



Type D hermetically sealed diffused junction silicon rectifiers are available in ratings from 50 to 600 prv in seven models. Each model is packaged in a case 0.240" in diameter by 0.405" long. All units have a maximum allowable d-c output current of 500 ma at 125°C ambient and 750 ma at 75°C ambient.

Maximum ratings (at 60-cps resistive loading) include: allowable one-cycle surge current, 15 amperes; peak recurrent forward current, 5 amperes; and surge current (4 millisec), 35 amperes.

Models D200, D400, and D600 feature a maximum allowable prv of 200, 400, and 600 volts, respectively and a maximum allowable rms voltage of 140, 280, and 420 volts, respectively.

PRICE: $0.415-$0.655 ea in lots of 1M. **AVAILABILITY:** 21 days. **MFR:** Mallory Semiconductor Co., Div. P. R. Mallory & Co., Inc., Dept EP, DuQuoin, Ill. **SALES MGR:** W. Thorn, ME 6-5353; for nearest rep see eem p. 1777 (1961-62 Ed.)

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DRAKE . . . Oil — Water — Dustproof "TITELITE" INDICATOR LIGHTS

TYPE NO. 79 HEAVY DUTY

Specially designed, ruggedly built "TITELITES" thoroughly protect against intrusion of Oil, Water or Dust into such equipment as *Switch Gears, Motor Controls, Outdoor Control Panels* and many other applications.

Both Heavy Duty and Miniature types may be used with either neon or incandescent lamps. Type No. 79 is available with either Candelabra Screw or Double Contact Candelabra Base, in three glass lens styles — Faceted or Plain Beehive for maximum side visibility; Flat, generally used with printed heat resistant discs for readout or warning purposes. Type No. 205 takes any Miniature Bayonet T3¼ lamp; may be had with a variety of colored lenses, plain or fluted.

TYPE NO. 205 MINIATURE

Both styles are available for MIL applications and are UL Listed.

★ *SEND FOR DATA SHEET 6105 WITH FULL DETAILS AND SPECIFICATIONS*

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4624 N. OLCOTT AVENUE • CHICAGO 31, ILLINOIS

MINIATURE LIGHTING SPECIALISTS

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MM MILITARY CASES

COMBINATION • TRANSIT • INSTRUMENT

MIL-T-945, T-4734, T-21200, STD-108, C-4150

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NO DIE CHARGE

Your choice of over 1,000,000 variations in dimensions, proportions, metals, finishes, and custom accessories for military combination, transit, instrument and portable cases. Whatever your need, the MM (multi-measure) method gives you high production savings even on custom runs as low as 25 units. Send us your print or requirements direct or contact your MM representative.

FREE: Send for free catalog and dimension specification sheets

MM ENCLOSURES, INC.

111 BLOOMINGDALE RD., HICKSVILLE, N. Y.

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316 Hand-Soldered Joints.

Dip-soldering techniques just aren't good enough. Navcor transistorized digital systems modules (an elegantly conceived, compatible series of plug-in cards) are as near to perfection as the present state of the art can get. And their production measures up to their design.

Result (from a paper read at the 1960 National Electronics Conference, Chicago): "The motion comparison logic, reversible counter and the digital-to-analog converter are composed of Navcor 300 Series Modules. Over an operating period of eight months, there was only one component failure."

Which is why, in Government and industrial specifications, you so often see the phrase "Navcor, or equal."

Data on modules or consultation on complete special-purpose digital systems on request. Navcor, Valley Forge Industrial Park, Norristown, Pa. GLendale 2-6531.

NAVCOR

NAVCOR

Transistorized Digital Systems Modules and Special-Purpose Digital Systems

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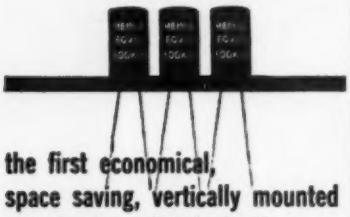
NEW CARBON FILM RESISTORS



the first economical, space saving, vertically mounted resistor for printed circuit applications

Low cost — smaller space . . . two items high on the list of vital importance in solving today's tough design problems. MEPCO's new miniature ¼ W Carbon Film resistors were specifically designed to break the cost and space barrier in printed circuit applications. Having both leads extending from one end and available in three different lead spacing arrangements, these Carbon Film Resistors for vertical mounting offer advantages never before available. Write or call today for samples and literature.

MEPCO

MEPCO, INC.
Morristown, New Jersey
Manufacturers of Precision Resistors

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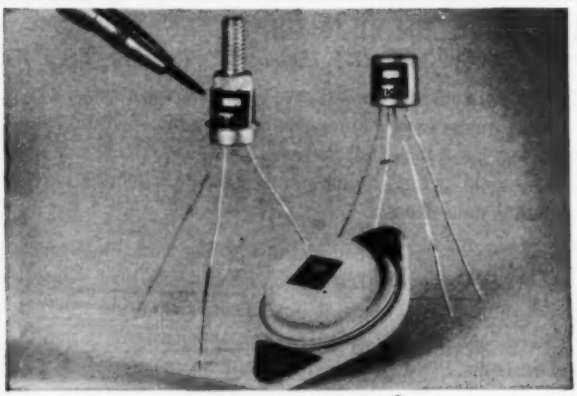

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DETECTS ELECTRONIC OVERHEATING

Overheating of transistors, diodes, resistors and transformers is detected by Temp-Plate in a positive, direct manner. Simple, easy to use, irreversible, Temp-Plate is the little plastic tab that sticks to the component, turns black when the temperature reaches any desired value between 100° and 1100°F. Impervious to ambient atmosphere and production line handling, Temp-Plate is accurate to ±1%, provides for absolute indication of heat damage. Write now for descriptive literature.

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NEREM TECHNICAL PROGRAM

(Continued from Page 65)

Somerset Hotel (Regency Ballroom)
2:30 - 5:00 P.M.

SESSION 15: Microelectronics

Chairman: D. E. Thomas
Sylvania Electric Products Inc., Woburn, Mass.

15:1: Microwatt-Microelectronics
W. W. Gaertner, CBS Laboratories, Stamford, Conn.

15.2: Scribe- and Trace-Plating; New Techniques for Microelectronic Semiconductor Devices
W. Rindner and J. M. Lavine, Raytheon Company, Waltham, Mass.

15.3: Thin-Film Titanium Circuits
W. D. Fuller, Lockheed Aircraft Corp., Sunnyvale, Calif.

15.4: Solid-State Micrologic Elements
N. Gault and J. Nall, Fairchild Semiconductor, Div. of Fairchild Camera Inst. Corp., Palo Alto, Calif.

Somerset Hotel (Louis XIV Ballroom)
NEREM 61 Social Hour and Banquet
7:00 P.M.

Guest Speakers —

J. A. VOLPE, Governor, Commonwealth of Massachusetts
OPTICAL MASERS: Past, Present, Future and Imaginary
C. H. TOWNES, Provost, Massachusetts Institute of Technology

THURSDAY, NOVEMBER 16, 1961
Commonwealth Armory (Marriott Hall)
10:00 A.M. - 12:30 P.M.

SESSION 16: Biomedical Electronics 1 — Machine Deciphering of Biological Data

Chairman: S. Aronow
Massachusetts General Hospital, Boston, Mass.

16.1: Electrical Signals and Noise in Biomedical Research
F. R. Ervin, Massachusetts General Hospital, Boston, Mass.

16.2: Techniques for Processing Signals in Biomedicine
H. S. McDonald, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

16.3: A Basic Digital Data System for Biochemical Studies
S. Molner, Epsco, Inc., Cambridge, Mass.

16.4: Display and Computing of Biological Data
T. A. Kalin
Air Force Cambridge Research Laboratories and Mass. Gen. Hospital, Bedford and Boston, Mass.

16.5 Bioelectrical Recording
B. S. Rosner, Veterans Administration Hospital, West Haven, Conn.

Commonwealth Armory (Goldsmith Hall)
10:00 A.M. - 12:30 P.M.

SESSION 17: Microwave Solid-State Devices I

Chairman: Glen Wade
Raytheon Co., Burlington, Mass.

17.1: Generation of Coherent Light
H. Statz, Raytheon Co., Waltham, Mass.

17.2: Microwave Modulation of Light by the Electrooptic Effect
I. P. Kaminow, Bell Telephone Laboratories, Inc., Holmdel, N .J.

17.3: Microwave Phototubes and Light Demodulators
A. E. Siegman, Stanford University, Stanford, Calif.

17.4: Parametric Amplifiers — A Status Report
R. Adler, Zenith Radio Corp., Chicago, Ill.

Somerset Hotel (Louis XIV Ballroom)
10:00 A.M. - 12:30 P.M.

SESSION 18: Atomic Frequency and Time Standards I

Chairman: P. Bender
National Bureau of Standards, Washington, D. C.

18.1: The Cesium Atomic Beam Frequency Standard
J. H. Holloway, Bomac Laboratories, Inc., Beverly, Mass.

18.2: The Rubidium Optically-Pumped Frequency Standard
R. Rempel, Varian Associates, Palo Alto, Calif.

18.3: The Hydrogen Maser
D. Kleppner, Harvard University, Cambridge, Mass.

18.4: Stable Radio Frequencies for Atomic Standards
C. L. Searle, Mlt, Cambridge, Mass.

(Continued on Page 71)

NEREM TECHNICAL PROGRAM

(Continued from Page 70)

Somerset Hotel (Cleveland Plaza Ballroom)
10:00 A.M. - 12:30 P.M.

SESSION 19: Professional Development Programs — Panel Discussions

Chairman: R. M Fano
MIT, Cambridge, Mass.
Panel Members:
J. T. Thomas, Minneapolis-Honeywell Regulator Co., Boston Mass.
N. Marcuvitz, Polytechnic Inst. of Brooklyn, Brooklyn, N. Y.
R. Villers, Rautenstrouch and Villers, N. Y. C.
J. Wolfe, General Electric Co., Schenectady, N. Y.

Commonwealth Armory (Marriott Hall)
2:30 - 5:00 P.M.

SESSION 20: Biomedical Electronics II — Human Performance and Design

Chairman: A. T. Kornfield
Biosearch Co., Boston, Mass.

20.1: Life Support by Control of External Environment in Closed Compartments
A. Bialecki, Chemical Eng. Sect., Electric Boat Co., Groton, Conn.

20.2: Life Support by Control of Internal Environment, Artificial Hearts, Lungs and Pacemakers
A. Kantrowitz, Maimonides Hospital, Brooklyn, N. Y.

20.3: Sensory Aids — Implants and Endosondes
V. K. Zworykin, RCA Laboratories, Princeton, N. J.

20.4: Action Aids — Artificial Limbs and Other Prosthetic Devices
H. Ebehart, National Research Council, Washington, D. C.

Commonwealth Armory (Goldsmith Hall)
2:30 - 5:00 P.M.

SESSION 21: Microwave Solid-State Devices II

Chairman: R. Kingston
MIT Lincoln Laboratories, Lexington, Mass.

21.1: Semiconductor Microwave Control Devices
L. Gould, M. Bloom and R. Tennenholtz
Microwave Associates, Inc., Burlington, Mass.

21.2: The Application of Tunnel Diode Amplifiers
J. J. Sie, Micro State Electronics Corp., Murray Hill, N. J.

21.3: Microwave Harmonic Generators Using Varactor Diodes
M. E. Hines, Microwave Associates, Inc., Burlington, Mass.

21.4: Superconducting Magnets
S. H. Autler, MIT Lincoln Laboratories, Lexington, Mass.

Somerset Hotel (Louis XIV Ballroom)
2:30 - 5:00 P.M.

SESSION 22: Atomic Frequency and Time Standards II

Chairman: J. King
MIT, Cambridge, Mass.

22.1: World-Wide Clock Synchronization
F. H. Reder, USA Signal Research and Development Laboratory
Ft. Monmouth, N. J.

22.2: Time Standard Requirements in Satellite Tracking for Navigation and Geodesy
G. C. Weiffenbach, Johns Hopkins University, Silver Springs, Md.

22.3: On the General Use of Atomichrons®
E. F. Grant, National Co., Malden, Mass.

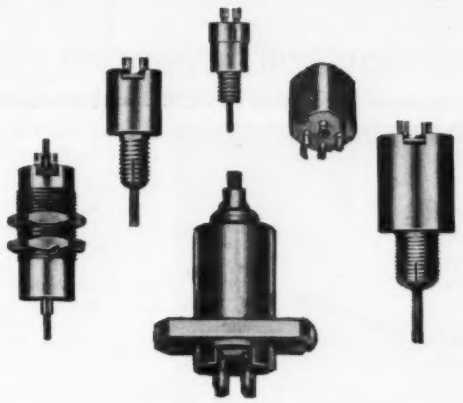
22.4: An Atomic Definition for the Unit Time
J. M. Richardson, Radio Standards Laboratory,
National Bureau of Standards, Boulder, Colo.

22.5: Time Jitter and Its Measurement
R. G. Heaton, Laboratory For Electronics, Boston, Mass.

Somerset Hotel (Cleveland Plaza Ballroom)
2:30 - 5:00 P.M.

SESSION 23: Dynamics of Research and Development — A Panel Discussion

Chairman: R. L. Blanchard
Trans-Sonics, Inc., Lexington, Mass.
Panel Members:
W. K. Linvill, Stanford University, Stanford, Calif.
L. L. Beranek, Bolt, Beranek and Newman, Inc., Cambridge, Mass.
J. W. Forrester, MIT, Cambridge, Mass.
O. T. Fundingsland, Raytheon Co., Lexington, Mass.
J. E. Storer, Sylvania Electric Products, Inc., Waltham, Mass.



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CAMBRIDGE THERMIONIC CORPORATION
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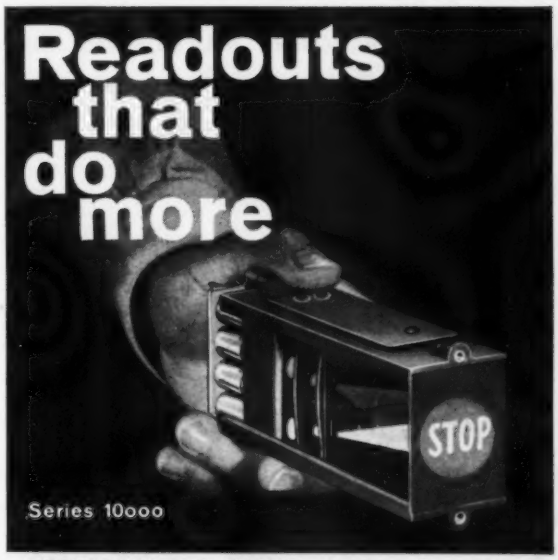

DISPLAY NUMBERS, WORDS, COLOR, AND SYMBOLS! A versatile readout employing all the above mentioned features plus a large one inch character size. Ideal for computers, electrical and electronic test equipment, control systems, and annunciation boards. Price complete from $18.00. Write today for complete detailed specifications and quantity prices.

INDUSTRIAL ELECTRONIC ENGINEERS, Inc.
5528 Vineland Avenue, North Hollywood, California

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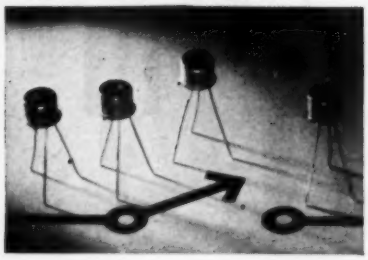
SILICON SWITCHING TRANSISTORS [*Raytheon Co., Semiconductor Div.*]

eem File System Sec. 4800 electronic engineers master

4 Watts Collector Dissipation At 25°C Case Temperature



Designed for servo controls, d-c control circuits, and power switching of up to 4 watts, these four fast switching silicon transistors meet the requirements of specification MIL-S-19500B. The *npn* types have TO-5 cases capable of withstanding storage temperatures of 200°C.

The 2N497 and 2N656 are 60-volt (collector-base and emitter-breakdown voltage) devices and the 2N498 and 2N657 are 100-volt devices. All four have an emitter-base breakdown voltage of 8 volts, a collector dissipation of 0.8 watt at 25°C ambient and a junction temperature range of −65 to 200°C. At maximum voltage, the units feature a collector-to-base reverse current of 100 μa, an emitter-to-base reverse current of 250 μa, and a collector-emitter reverse current of 250 μa.

PRICE: $5.90-$7.80 (100-999, depending on type). **AVAILABILITY:** From Stock. **MFR:** Raytheon Co., Semiconductor Div., 150 California St., Dept EP, Newton, Mass. **SALES MGR:** W. Schoonmaker, DE 2-7177; for nearest rep see **eem** p. 1823 (1961-62 Ed.)

Check **316** *Reader Service Card 11/61*

GERMANIUM VARACTOR DIODES [*Philco, Lansdale Div.*]

Harmonic Generators At Frequencies To 3, 6, And 10 GC

Comprising types L-4110, L-4111, and L-4112, these varactor diodes have cutoff frequencies of 25, 60, and 100 Gc, respectively.

Tests were performed on 1 and 2 Gc and 2 to 4 Gc doublers of the shunt and series type, quadruplers from 600 mc to 2.4 Gc, and quintuplers from 600 mc to 3 Gc. At still higher frequencies, evaluations were carried out in X-band quadruplers. Typical efficiencies ranged from 35 to 60% in the S-band multipliers and 15% for the X-band quadrupler.

Models L-4110, L-4111, and L-4112 feature (respectively) maximum power dissipation of 0.5, 0.3, and 0.1 w; a breakdown voltage of 80, 40, and 20 v; and a junction capacitance at 100 kc of 1.0-2.0, 0.35-0.7, and 0.17-0.35 pf.

PRICE: L-4110 and L-4112: $120.00; L-4111: $80.00. **AVAILABILITY:** Contact Sales Offices below. **MFR:** Philco, Lansdale Div., Tioga & "C" Streets, Dept EP, Phila. 34, Pa. **SALES OFFICES:** See **eem** p. 1809 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1402, 1403

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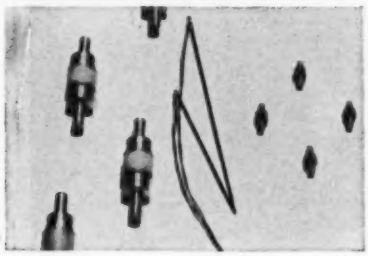
EPITAXIAL MICROWAVE VARACTORS [*Sylvania Electric Products, Inc.*]

Cutoff Frequencies To 150 Gc At −45 V Breakdown Voltage



The high-Q, high-breakdown voltage diodes (left), in a double-ended ceramic package, and (right) in the Micro-Min construction, exhibit frequencies as high as 100 Gc and capacitance values as low as 0.15 pf at −6 v.

Micro-Min diodes, claimed to be one-tenth the size of conventional units, are suited for printed-circuit applications in microwave equipment. The units feature good power handling capabilities as harmonic generators.

As doublers at L-band, the diodes show conversion efficiencies as high as 70%.

The D4200 series are in the double-ended microwave cartridge and the D4300 series are in the Micro-Min package.

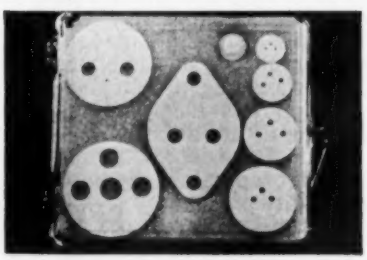
Each series has 228 types of varactors, differing by the reverse breakdown voltage, junction capacitance, and cutoff frequency.

PRICE: $15.00-$200.00. **AVAILABILITY:** Stock to 4 wks. **MFR:** Sylvania Electric Products, Inc., Semiconductor Div., Dept EP, Woburn, Mass. **SALES MGR:** M. E. Groll, WE 3-3500; for nearest rep see **eem** p. 1851 (1961-62 Ed.)

Check **318** *Reader Service Card 11/61*

BERYLLIUM OXIDE HEAT SINK KITS [*National Beryllia Corp.*]

Fits Popular "TO" Size Semiconductor Cases



Beryllium-oxide heat-sinks electrically isolate semiconductors from chassis while conducting heat away to allow operation at higher power levels and lower junction temperatures.

Beryllia improves reliability because surface scratches or prolonged usage at high temperatures do not produce dielectric breakdown in the material, it is claimed.

Four kits are available. Kit A contains three TO3, two TO5, one TO8 and two TO18 heat sinks.

Kit B contains one TO3, two TO5, four TO8 and two TO18 sinks.

Kit C contains one TO3, six TO5, one TO8 and two TO18 sinks. Kit D contains one TO3, two TO5, one TO8, and seven TO18 sinks.

PRICE: $18.00. **AVAILABILITY:** From stock. **MFR:** National Beryllia Corp., First & Haskell Aves., Dept EP, Haskell, N. J. **SALES OFFICES:** See **eem** p. 1793 (1961-62 Ed.)

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NORTH HILLS

Model CS-140

GYRO TORQUER SUPPLY

- Precision Current Source
- DC and/or AC
- Pulse Output Possible

For testing and measurement of gyro torquers, zener, reference diodes, magnetic components, other current sensitive devices.

- Current Range is 0.1 μa to 150 ma
- Regulation 0.002%
- Resolution 1 part per million

In use by leading companies for gyro torquer supply, component reliability testing, calibration, reference zener testing.

Literature describing this and other constant current sources from 0.1μa to 30 amp. may be obtained from

nh NORTH HILLS
ELECTRONICS, INCORPORATED
GLEN COVE, L.I., N.Y. ORiole 1-5700

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KEMLITE
Super-Intensity
ELECTRONIC
FLASH TUBES

KEMLITE's "energy concentrated" lighting has proven itself in:

- High Intensity Flash for missile Tracking
- Visual Aircraft Perception at Long Range
- Black Light and Infra-Red Applications
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- Electronic Flash for Photography
- High Intensity Beacons
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KL KEMLITE
Laboratories, Inc.
1819 W. Grand Ave., Chicago 22, Ill.

New project problems invited

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READER PROBLEMS

(Continued from Page 45)

(10019) which has three digits ¼" high and occupies less than 1½" square panel space. The counter has an input speed of 300 rpm max continuous and 800 rpm max intermittent (one revolution of input shaft equals 10° display).

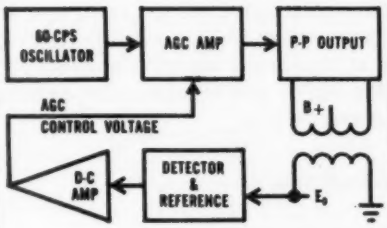
F. Lebowitz,
Ford Inst. Co.,
Long Island City, N. Y.

Line Voltage Regulator (No. 188) *We require a line voltage regulator to meet the following requirements: input 115 v ± 10%, 60 cps ± 10%; output voltage 118 v ± 0.1% and output load 500 va +0% −50%.*

The input voltage, while substantially constant at listed values will be subjected to temporary voltage spikes up to 160 v lasting for approximately 10 seconds. The output voltage must be constant within the specified limit while the spikes are present.

The regulator may be either electronic or magnetic, packaged to meet military requirements for components and shock vibration.

★ **Solution A:** The following block diagram may seem complex but the advantage offered is that the output is not derived from the input, hence input line fluctuations do not effect output.



The 60 cps oscillator generates a signal of convenient amplitude (1 to 2 volts) which is fed through the agc amplifier to drive the output stage. This output voltage is detected and compared to a reference; the difference drives the d-c amplifier, the output of which controls the agc amplifier gain. Change in output voltage is reflected as a correcting signal at the agc control point.

A. Blumenfeld, Staff Eng.,
General Precision, Inc.,
Pleasantville, N. Y.

(Continued on Page 74)

Out of the constant investigation into epitaxial growth comes **Motorola's** new "star" configuration, employed for the first time in:

SILICON PLANAR TRANSISTORS

Special advantages, for highly efficient operation in circuits ranging from DC to 100 mc., include:

A "STAR" IS BORN

1300% lower saturation resistance at 0.5 amps.

400% better high-frequency gain.

550% lower output capacitance.

300% better switching time.

at factory price

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AREA CODE 516, PIONEER 6-8520

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new!

ultRelay

The Static Relay with Meter Movement Sensitivity

The ultRelay, a new solid state ultrasensitive relay with input sensitivity to 0.25 microwatt, was designed specifically for applications which previously required fragile meter movement relays. Absence of mechanical contacts, bearings and moving coils permit millions of switching cycles and freedom from failures caused by contact chatter, vibration, wear and burning.

- **Input sensitivity to 0.25 microwatt D.C.**
- **Low input resistance**
- **Directly operable from thermocouple output**
- **Power amplification to 95 db**
- **60~ 115V loads to 400 watts**
- **Vibration and shock resistant**
- **No external reset circuits required**
- **Single, double or differential input options**
- **Electrical isolation between load and control**
- **Size, 3" x 3" x 3⅛"**
- **Single pole, N.O. or N.C. units available**

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1414 Chestnut Avenue, Hillside 5, New Jersey; MUrdock 8-0250
5456 W. Washington Boulevard, Los Angeles 16, California; WEbster 8-3227

Check **93** *Reader Service Card*

READER PROBLEMS

(Continued from Page 73)

Solution B: We can supply a custom designed regulator of the voltage spike characteristics. The basic principle behind our voltage regulator is a zener diode reference feeding a magnetic amplifier control. Output could be ac or dc. Because of the zener diode reference d-c output would be simpler. Production of rms output requires filtering our signal so the dc zener voltage reference is proportional to the rms value.

H. Buschman, Pres.,
Bush Transformer Corp.,
Endicott, N. Y.

Efficient Retractable Antenna (No. 195)
We would like suggestions on obtaining maximum operating efficiency from a half-wave dipole, center-fed, retractable antenna at 50 mc without affecting its performance at 200 mc. The antenna is of flexible steel tape and extends and retracts by knob control; each dipole arm is 31" max. Fully retracted, the antenna is resonant at 200 mc.

Solution A: To increase the efficiency of a retractable antenna the primary factor is to provide a better match by making the antenna resonant.

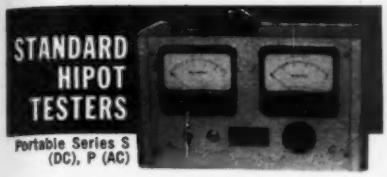
At resonance, the electrical length of each arm should be a quarter wavelength. This can be accomplished by installing a loading coil at the base of each arm.

The capacitance of each arm is $C=17l/[(ln24l/D)-1][1-(fl/246)^2]$ where l=length of the arm in feet, f=frequency in megacycles and D=diameter of the arm in inches.

In this case, an effective diameter should be used. Assuming the arms to be rectangular, a good approximation is to use the geometric-mean cross-sectional dimensions as the effective diameter. A coil resonant with the capacitance calculated at the desired resonant frequency should be inserted at the base of each arm.

An antenna tuner inserted in the transmission line feeding the dipole may be used to tune the antenna to resonance.

B. R. Hatcher, Project Eng.,
Chu Associates, Littleton, Mass.



FEATURING—
- Low cost.
- Automatically limited maximum short circuit current (self-protecting).
- Direct indication of leakage current on large meter.
- Direct reading KV meter, connected directly across high voltage output for maximum accuracy.
- Extremely simple controls for use by inexperienced personnel.
- Continuously variable output voltage.
- Selenium rectifiers are used for ruggedness (on DC units).

SHORTING SOLENOID OPTIONALLY AVAILABLE ON DC UNITS

MODEL NO.	OUTPUT VOLTAGE, KV	PRICE
S 2 DC	0- 2 KV DC	$220.
S 5 DC	0- 5 KV DC	230.
S10 DC	0-10 KV DC	295.
S20 DC	0-20 KV DC	400.
S30 DC	0-30 KV DC	490.
P 2 AC	0- 2 KV RMS	$200.
P 5 AC	0- 5 KV RMS	250.
P10 AC	0-10 KV RMS	290.
P15 AC	0-15 KV RMS	330.
P20 AC	0-20 KV RMS	420.

PE SEE GENERAL CATALOG FOR OTHER TEST SETS.

PESCHEL ELECTRONICS, INC.
R.F.D. #1, Patterson, N. Y.
Phone Patterson, N. Y. (TRinity 8-3251)

Check **87** *Reader Service Card*

PRODUCT LITERATURE

(Continued from Page 64)

RULON AND TEFLON PARTS **Sec. 2500**

Brochure 9572 compares the electrical, physical, mechanical and chemical properties of Rulon and Teflon. Rulon is a reinforced TFE fluorocarbon resin that is said to offer all the advantages of Teflon, plus increased mechanical strength and wear resistance. Plastics Div., *Dixon Corp., Dept EP, Bristol, R. I.*

Check **223** *Reader Service Card*

SPRINGS **Sec. 2500**

This 16-page manual summarizes basic information on helical springs, flat springs, wire forms, special fasteners, precision metal stampings and assembled spring-like devices. Information is given on performance, accurate material selection and quality control measures. Incorporated are design briefs which simplify the specifying of compression, extension, torsion and flat springs, as well as wire forms. *Associated Spring Corp,. Dept EP, Bristol, Conn.*

Check **224** *Reader Service Card*

(Continued on Page 81)

SPECTRA-FLEX CABLES ®

DESIGNED TO DO A DIFFICULT JOB

By -

SPECTRA-STRIP WIRE & CABLE CORP.
P.O. BOX 415 Garden Grove, Calif.

Use SPECTRA-FLEX and get exactly what you need.
Multi-conductor, multi-color,
all gauges from #10 AWG to #30 AWG.
Any type of wire with
a vinyl jacket.

A COMPLETE LINE OF HOOK-UP MATERIALS.
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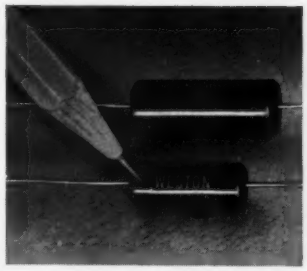
WESTON® **VAMISTORS**
PRECISION METAL FILM RESISTORS
OFFER YOU 5 MAJOR RESISTOR BENEFITS

Dissipation:
Get ½-watt ratings in ¼-watt size at 125° C!



Only Weston missile-line Vamistors give double rating in the same physical size of an ordinary metal film resistor. Why? Because the convection cooling action of inert gas within the Vamistor, together with its internally deposited metal film, dissipates heat at a faster rate.

Vamistors meet all MIL specs and provide premium quality at no extra cost. In addition, Weston Vamistors give you the industry's:

1. **HIGHEST STABILITY**
2. **LOWEST NOISE**
3. **HIGHEST VOLTAGE AND RESISTANCE RATINGS**
4. **SUPERIOR FREQUENCY RESPONSE**
5. **and HIGHEST WATTAGE DISSIPATION**

Free evaluation samples and applications assistance are available through Weston field representatives. Write today for technical information and life test data.

DAYSTROM INCORPORATED
WESTON INSTRUMENTS DIVISION
Newark 12, New Jersey

Reliability by Design

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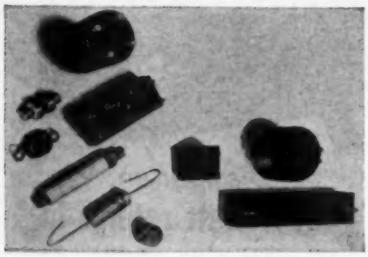
HIGH-VOLTAGE POTTED RECTIFIER ASSEMBLIES [*Solitron Devices, Inc.*]

eem File System Sec. 4800 electronic engineers master

For Power Equipment Field Rated To 50,000 PIV



Increased from 1 to 6 amp d-c per block, SD1 Series Solidpacks double-diffused silicon high-voltage rectifier assemblies are rated to 50,000 peak-inverse volts. Over 1,000 standard sizes are available.

Units are offered in single-phase (half wave, center tap or full wave) and three-phase (half wave, full wave or star) configurations. Protective networks, voltage doublers and tube replacements are also available.

Operating and storage temperature range is from −65°C to 150°C.

Overall lengths vary from ⅛" to 5⅛"; one 6-kv assembly measures ¾" x ¾" x 1".

These assemblies can be used as replacements for selenium rectifiers.

PRICE: $3.50 to $350.00 ea depending on requirement). **AVAILABILITY:** 2 wks. **MFR:** Solitron Devices, Inc., 500 Livingston St., Dept EP, Norwood, N. J. **SALES MGR:** S. Sussman, PO 8-3770; for nearest rep see **eem** p. 1842 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1414

Check **320** *Reader Service Card 11/61*

SEMICONDUCTOR COOLING KIT [*Delta-T Semiconductor Cooling Div., Wakefield Engineering, Inc.*]

Includes Natural And Forced Convection Units

This cooler kit contains both complete-unit and modular-component semiconductor coolers to enable designers to conduct tests on their own circuits within the physical layout and environment of their choosing.

The units and components of the kit may be duplicated or replaced with stock items.

A handbook describes the theory and practical techniques of temperature, power and air flow measurements.

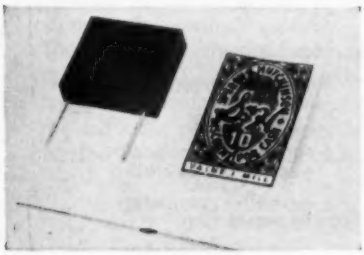
Included in the kit are: natural convection coolers NC-401, NC-403, NC-421, NC-423, and forced convection types FC-501, FC-502, FC-504; FCA-800 is a forced-convection modular cooling package with fan that provides mounting stations for six semiconductors.

PRICE: $38.50. **AVAILABILITY:** From stock. **MFR:** Delta-T Semiconductor Cooling Div., Wakefield Engineering, Inc., 414 Main St., Dept EP, Wakefield, Mass. **SALES MGR:** D. Thomas, Tel. 245-5900; for nearest rep see **eem** p. 1876 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 775, 1384

Check **321** *Reader Service Card 11/61*

HIGH-VOLTAGE/LOW-LEAKAGE MICRODIODE [*MicroSemiconductor Corp.*]

Provide Conductances Higher Than 200 Ma



Typical reverse leakage of the MC100 1,000-volt diode is less than 25 mμa at 80% V_r.

This single-junction unit provides conductances higher than 200 ma at ±1.0 v and up to 200-ma average rectified current.

Capable of being connected in series for potentials in excess of 30 kv, a typical 10-kv unit (illustrated) fits an envelope of 0.140" x 0.500" x 0.550" with a leakage current of 2 μa at 100°C and rated piv.

Special 1.5-kv models are available with conductances of 1 ampere at 1-volt dc.

Reliability and performance exceeding requirements of MIL-S-19500B and MIL-STD-202B are achieved through crystal surface passivation.

Ambient temperature range is from −65°C to 200°C, with a 300-mw dissipation rating.

PRICE: MC100 $7.00 ea (sm qty). **AVAILABILITY:** From stock. **MFR:** MicroSemiconductor Corp., 11250 Playa Ct., Dept EP, Culver City, Calif.

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SERVO GEAR BOX [*PIC Design Corporation*]

eem File System Sec. 4900 electronic engineers master

Backlash Held To 30 Minutes Max

Providing even and exact binary ratios from 2:1 to 625:1, this servo gear box line, for servo, computer and research applications, comprises over 720 variable units.

Available in light, medium, and heavy-duty models, the boxes provide a wide variation in design and mounting arrangements.

Backlash, measured at the output shaft with the input shaft locked, is held to a maximum of 30′, in all models.

Maximum rated output torque ranges from 250 oz-in. in the ⅛" shaft series, to 500 oz-in. in the ¼" shaft series.

All units are available with slip clutch, antibacklash gears or a combination of both.

PRICE: Standard Model $80.00 to $140.00. **AVAILABILITY:** From stock. **MFR:** PIC Design Corp., 477 Atlantic Ave., Dept EP, East Rockaway, N. Y. **SALES MGR:** P. J. Wellenberger, LY 3-6470; for nearest rep see **eem** p. 1803 (1961-62 Ed.)

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modern, low-cost way to precision measurements...

AEROVOX DECADE BOXES

Inductance, Resistance and Capacitance Decades in extra-compact and rugged design for accurate and dependable performance. Quality components used throughout to provide the same precise quality standards, electrically and mechanically, as finest lab-type equipment.

Units housed in heavy-duty, seamless steel cases with durable gray finish. All one size—5⅛"L x 3⅛"W x 2 3/16"H. Black face plates with white markings. Highest value multiplier on left.

Available from all Aerovox Parts Distributors, write for descriptive literature...

AEROVOX CORPORATION

DISTRIBUTOR DIVISION

New Bedford Massachusetts

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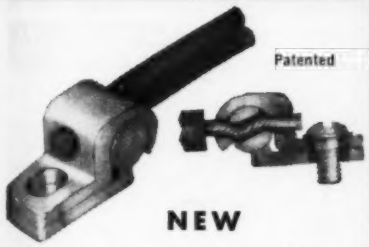

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NEW

Gamma's Gentle Giant assures FAIL-SAFE electrical termination!

- **Vibration proof** . . . continuous positive lock
- **Greater strength** than the conductor
- **Lower heat rise** than conductor
- **Greater conductance** than conductor
- **No damage** to conductor
- **One operation** secures conductor and mount clamp
- **Reuseable** . . . quick connect and disconnect
- **Complete range of sizes,** in single and multiple configurations
- **NO SOLDER, CRIMPING TOOLS OR TORQUE WRENCHES REQUIRED**

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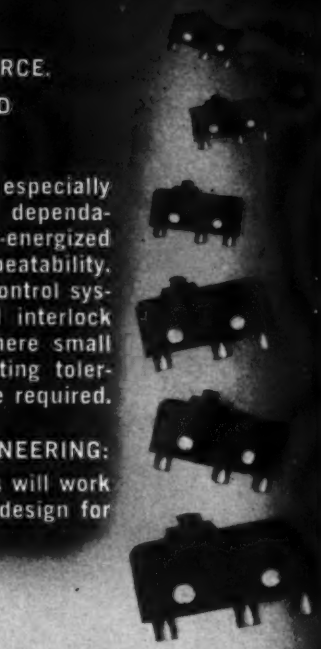
only U. S. Switch has the revolutionary self energized spring*

UNIQUE DESIGN GIVES THESE IMPORTANT FEATURES:

- LIFE RATING 15 TIMES THAT OF ANY OTHER SWITCH.
- GUARANTEED HIGH REPEATABILITY.
- HIGH POSITIVE CONTACT FORCE.
- GUARANTEED AGAINST DEAD BREAK.

This precision snap-action switch is especially suitable where size, precision and dependability are important factors. The self-energized spring assures long life and high repeatability. This is the ideal switch for use in control systems, missiles, aircraft, safety and interlock controls, and other applications where small movement differential, close operating tolerances, and high electrical rating are required.

CUSTOMER SERVICE AND ENGINEERING:
U. S. Switch Corporation's engineers will work with you in solving your particular design for unique applications.



Write today... for new U. S. Switch catalog with complete specifications. Get the facts on this revolutionary new switch with the self-energized spring.

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7 JEFRY LANE HICKSVILLE L. I., NEW YORK

SWITCH TO U. S. SWITCH THE ONLY SWITCH THAT LIVES UP TO ITS CLAIMS

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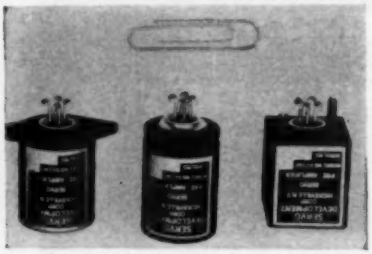
SERVO PREAMPLIFIER [*Servo Development Corp.*]

eem File System Sec. 4900 electronic engineers master

Transistorized High-Temperature Unit



Servo preamplifier Model 51-100 provides a gain-impedance product of 3.6 x 10^6; nominal gain is 1,200 at 3,000-ohms input impedance, while maximum undistorted output is 2 v rms across a 10K-ohm load.

Available in several package configurations, this potted unit employs silicon transistors to insure 125°C operation.

When used with a compatible amplifier (Model 50-100) for systems requiring additional gain and/or higher input impedance, an overall gain of 6 x 10^6 is available. Up to 3.5 w at 40 v rms can be delivered to a center-tapped size 11 servo motor.

This preamplifier can also be used with other amplifiers to extend their input impedance and/or gain.

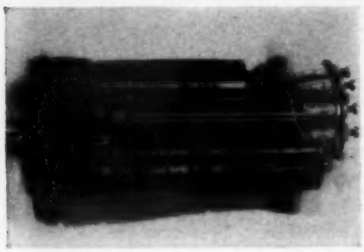
The unit requires 20 vdc input.

PRICE: Approx. $100.00. **AVAILABILITY:** 3 wks. **MFR:** Servo Development Corp., 2 Willis Ct., Dept EP, Hicksville, L. I., N. Y. **SALES MGR:** J. S. Hamm, OV 1-4343; for nearest rep see **eem** p. 1836 (1961-62 Ed.)

Check **324** *Reader Service Card 11/61*

INTEGRATED SERVO ASSEMBLY [*Daystrom, Inc., Transicoil Div.*]

Motor, Synchro And Gears In Size 11 Housing



This integrated servo assembly contains a size 5 motor, a size 5 synchro and precision gearing; gear ratios up to 875:1 are available.

The output shaft geared one-to-one with a size 5 control transformer, positions itself to agree with three-wire electrical input data received from any synchro control transmitter.

The complete assembly is housed in a size 11 configuration. For use with any of this manufacturer's servo amplifiers, the device is also available with a servo amplifier integrated in a slightly larger housing.

For remote transmission of angular positions, the device is replaceable as a module eliminating replacement problems caused by individual component failure.

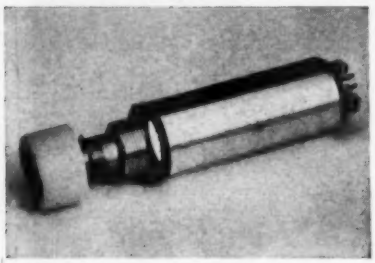
PRICE: $225.00 ea (100 qty). **AVAILABILITY:** 90 days. **MFR:** Daystrom Inc., Transicoil Div., Dept EP, Worcester, Penna. **SALES MGR:** J. J. Gattoline; for nearest rep see **eem** p. 1694 (1961-62 Ed.)

Check **325** *Reader Service Card 11/61*

SOLENOID-RELEASE SWITCHLITES [*Pendar, Inc.*]

eem File System Sec. 5100 electronic engineers master

Can Be Electrically Released From Remote Location



The solenoid-release Switchlites operate as regular push-on, push-off switches. They are actuated by manually pressing the pushbutton in and released by manually pressing the pushbutton in again, or by momentarily energizing the coil from a remote location. As the pushbutton returns to the free position, the coil is automatically disconnected.

Fourteen types are available up to 4pst and 2pdt. Switch ratings are: 28 vdc and 125 vac up to 2 amperes resistive. Coils are available for 6 volts (3.6 ohms), 12 volts (9 ohms) and 28 volts (50 ohms).

Two types of plunger action are offered: push-on, push-off (models 38-1122 thru 38-1140) and push-on, remain depressed, push-off (models 38-1222 thru 38-1240). Lamp circuits are independent, using T 1 ¾ lamps.

PRICE: $35.00. **AVAILABILITY:** 3 wks. **MFR:** Pendar, Inc., 14744 Arminta St., Dept EP, Van Nuys, Calif. **SALES MGR:** H. Theis, TR 3-3136; for nearest rep see **eem** p. 1806 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1484

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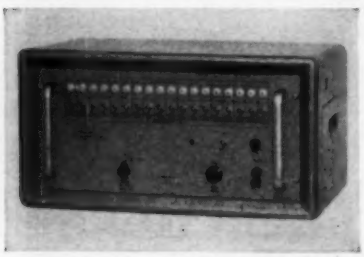
TELEMETRY CALIBRATOR [*Dytronics Company*]

eem File System Sec. 5200 electronic engineers master

Provides All IRIG Subcarriers Simultaneously



Telemetry calibrator Model 612, for the setup and calibration of the subcarrier discriminators of an f-m/f-m telemetering station, contains 18 separate oscillators which supply simultaneously all IRIG subcarrier frequencies. These frequencies can be deviated by ±7.5% for three-point calibration and discriminator linearity adjustment.

The use of separate oscillators provides simultaneous output of any desired combination of subcarrier frequencies, which permits the checking of adjacent channel rejection of the discriminator bank or transmitting links and reduces the setup time required for the ground station.

The instrument's frequency stability is better than 0.1%. Its output impedance of 400 ohms permits a complete bank of 18 subcarrier discriminators to be connected without appreciable loading.

PRICE: $2,400.00. **AVAILABILITY:** 3 wks. **MFR:** Dytronics Co., 5485 N. High St., Dept EP, Columbus 14, Ohio. **SALES OFFICES:** See **eem** p. 1793 (1961-62 Ed.)

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Correction Notice: Re Clifton Precision's Servo Amplifier SA 5601 listed on p. 80, Oct. issue, frequency range should be 10 to 30,000 cps ±3 db.

specify...

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Frequency Range (Gc/s)		2·7 to 3·5
Typical conditions at centre frequency	Output Power (mW)	1·0
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	Gain (db)	25
	Helix Voltage (V)	375
	Collector Voltage (V)	400
	Collector Current (mA)	0·15
Focusing Field (Gauss)		525
R.F. Connections		Coaxial Straight
Base		Int. Oct.
Recommended Solenoid		N4004

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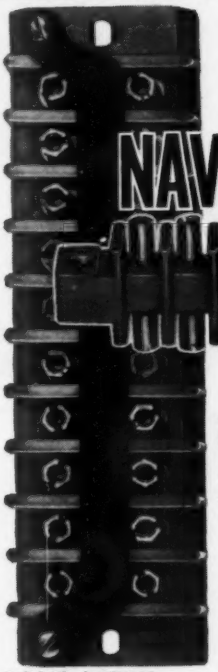

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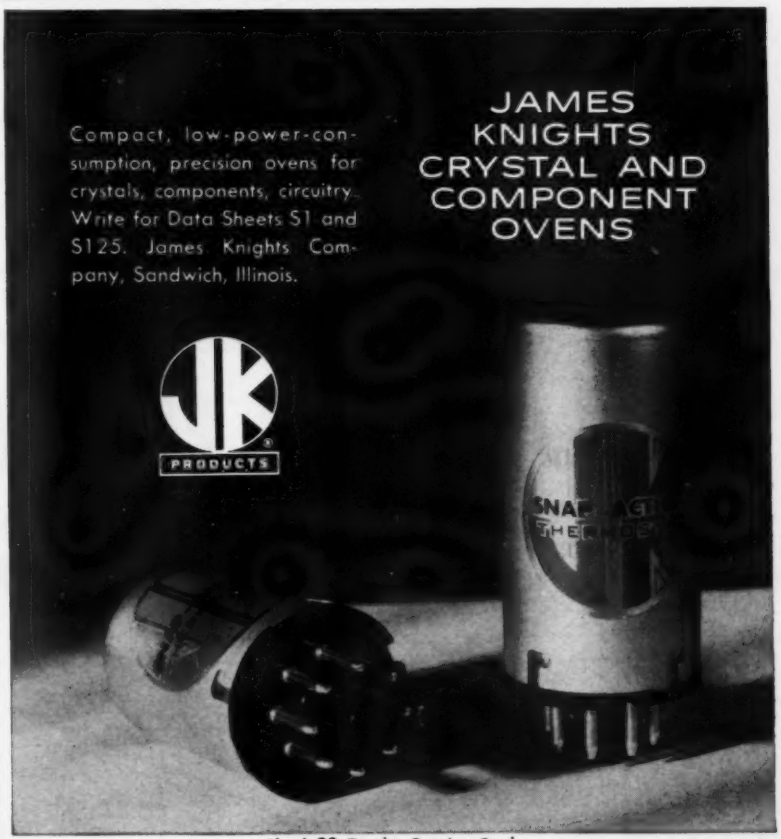

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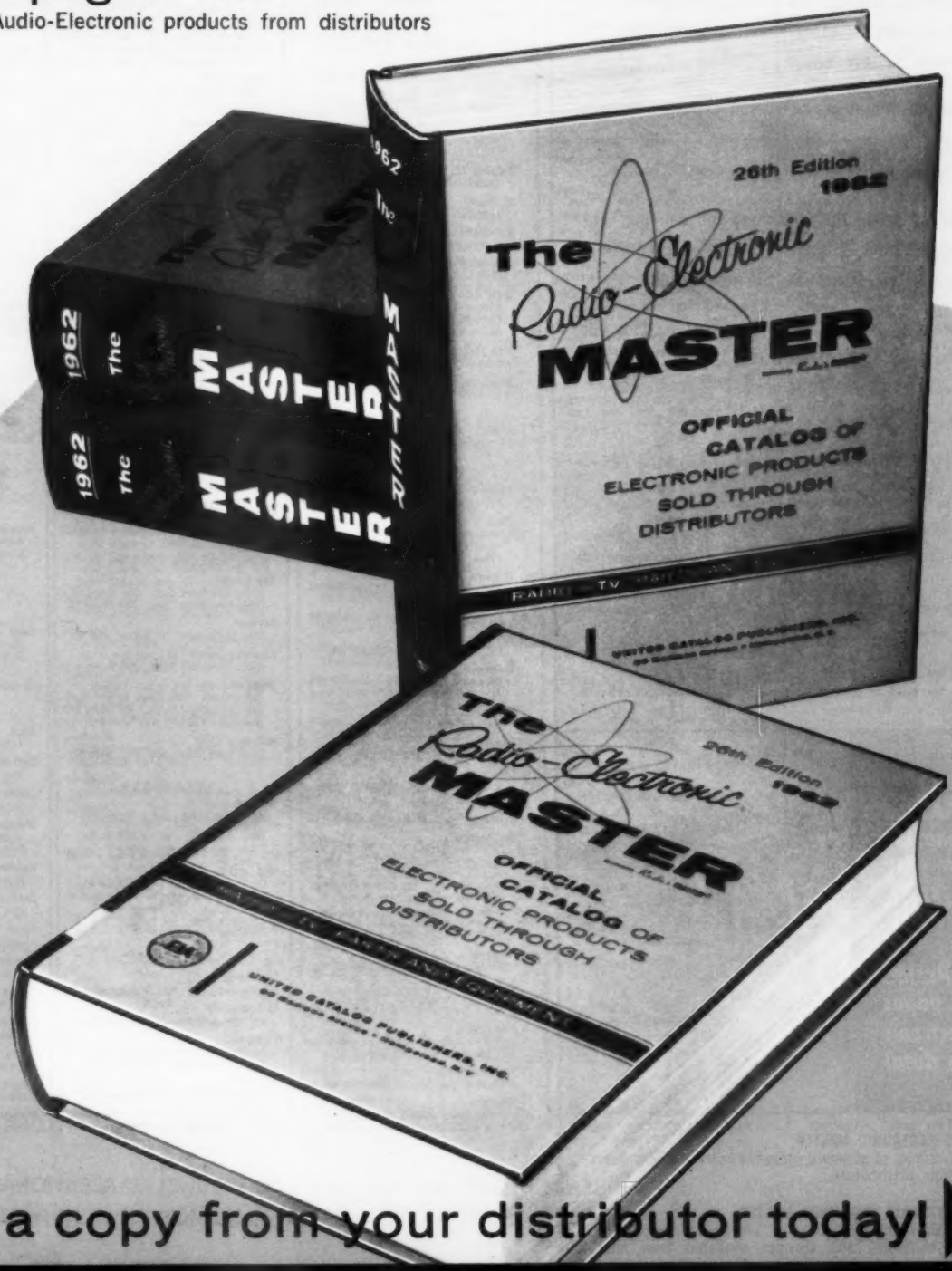
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Nidisco Passaic, Inc., 294 Passaic St.

Princeton
Sun Radio & Electr., 206 Center, Rt. 206

Ridgefield
Nidisco Cliffside, Inc., 484 Bergen Blvd.

Shrewsbury
Federated Purchaser, Inc., 483 Broad St.

Trenton
Nidisco Trenton, 985 Princeton Ave.

Union City
Nidisco Jersey City, 2812 Hudson Blvd.

NEW MEXICO

Albuquerque
Midland Spec., 1712 Lomas Blvd., N.E.
Walker Radio Co., 102 Granite Ave., N.W.

Roswell
R & R Supply Co., Inc., 605 E. 2nd St.

NEW YORK

Albany
Fort Orange Radio, 904-916 Broadway
E. E. Taylor Co., Inc., 465 Central Ave.

Batavia
Radio Equipment Corp., 5 Center St.

Bath
Rochester Radio Supply, 11 Liberty St.

Bay Shore
Gem Electronics, 1221 Sunrise H'way.

Bayside
Snyder Electr. Distr., 39-25 Bell Blvd.

Bellerose
Gem Electr., Inc., 247-40 Jericho Trnpike

Binghamton
Federal Electr., Inc., Vestal Parkway
Morris Distr. Co., Inc., 195 Water St.

Bronx
Gem Electr. Distr., 1216 Jerome Ave.
Gem Electr. Distr., 565 E. Fordham Rd.

Brooklyn
Gem Electr. of Bklyn, 59 Willoughby St.
Laco Indust. Electr. Supp., 4924 4th Ave.
Quad Electr., 1511 Coney Island Ave.

Buffalo
Genesee Radio & Parts, 144 Genesee St.
Genesee Radio & Parts, 2550 Delaware
Radio Equipment Corp., 312 Elm St.
Radio Equipment Corp., 3240 Sheridan
Standard Electr. Distr., 1505 Main St.
Standard Electr. Distr., 1476 S. Park Ave.

Farmingdale
Gem Electr. Distr., 34 Hempstead Trnpke

Forest Hills
Gem Electr., Inc., 101-10 Queens Blvd.

Geneva
Rochester Radio Supply Co., 62 Reed St.

Great Neck
Gem Electr., 271 Northern Blvd.

Hempstead
Davis Electronics Corp., 204 Main St.
Hempstead Electr., 412 Fulton Ave.

Hicksville
Gem Electr. Distr., Inc., 236 Broadway

Jamaica
Norman Radio Distr., 94-29 Merrick Rd.
Peerless Radio Distr., 92-32 Merrick Rd.

Lockport
Standard Electronics, Inc., 8 Elm St.

Long Island City
H. L. Dalis, Inc., 35-35 24th St.
Electronic Supp. Corp., 4108 Greenpoint

Lynbrook
Peerless Radio Distr., Inc., 19 Wilbur St.

Massena
Seaway Electr., Inc., 13 Wells St.

Mineola
Adelphi Electr., Inc., 142 Mineola Blvd.
Arrow Electr., Inc., 525 Jericho Turnpike

Mt. Vernon
Gem Electr. Distr., Inc., 66 E. 3rd St.

Newburgh
Chief Electr., Inc., 248 Washington St.

New York
Airex Radio, 85 Cortlandt St.
Arrow Electr., Inc., 65 Cortlandt St.
Bruno-New York, Inc., 460 W. 34th St.
Calvert Electr., Inc., 536 Broadway
Center Indust. Electr., 74 Cortlandt St.
Electronics Center, Inc., 160 Fifth Ave.
Gem Electronics, 202 E. 44th St.
Harvey Radio Co., Inc., 103 W. 43rd St.
Leonard Radio, Inc., 69 Cortlandt St.
Midway Radio & TV, 60 W. 45th St.
Milgray Electr., Inc., 136 Liberty St.
Milo Electr. Corp., 530 Canal St.
Sun Radio & Electr., 650 Sixth Ave.
Terminal-Hudson Electr., 212 Fulton St.
Terminal-Hudson Electr., 48 W. 48th St.
Terminal-Hudson Electr., 236 W. 17th St.
Terminal Radio Intern'l., 240 W. 17th St.

Niagara Falls
Niagara Falls Radio Equip., 1720 Pierce
Niagara Radio & Parts, 2601 Pine Ave.
Standard Electronics, 718 Ninth St.

North Tonawanda
Radio Equip. Corp., 110 Webster St.

Olean
Standard Electr., Olean, 504 E. State St.

Poughkeepsie
Chief Electronics, 14 N. Bridge St.
Higgins & Sheer, 105 Dutchess Turnpike

Richmond Hill
Anchor Electr. Distrs., 116-01 101st Ave.

Rochester
Masline Electr., Inc., 511 Clinton Ave., S.
Rochester Radio Supp., 600 E. Main St.

Syracuse
Harvey Radio, Syracuse, Pickard Dr.
Morris Electr., 1153 W. Fayette St.
Syracuse Radio Supp., 620 S. Salina St.

Troy
Trojan Electr. Supp., 15 Middleburgh St.

Utica
Valley Indus. Electr., 1415 Oriskany St., W.

Valley Stream
Gem Electronics, 218 Sunrise Highway

White Plains
Westchester Electr., 602-610 Mamaroneck

Woodside
Boro Electr., Inc., 69-18 Roosevelt Ave.

Yonkers
Gem Electr., 1937 Central Ave.

NORTH CAROLINA

Asheville
Freck Radio & Supp., 38-40 Biltmore Ave.

Burlington
Womack Electric Supply, 623 S. Worth St.

Charlotte
Southeastern Radio, 1200 W. Moorhead
Southern Electr., 919 W. Morehead St.

Durham
Womack Elec. Supply, 601 Ramseur St.

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(cont'd. on next page)

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Fayetteville
Southeastern Radio Supp., 525 Gillespie

Goldsboro
Womack Elec. Supply, 106 N. Carolina St.

Greensboro
Carolina Radio Supp., 834 Huffman St.
Southeastern Radio 404 N. Eugene St.

Greenville
Womack Radio Supply, 311 Boyd Ave.

Hickory
Southeastern Radio, 907 2nd Ave., N.W.

High Point
Womack Radio Supply, 654 N. Main

Jacksonville
Southeastern Radio, 513 New Bridge St.

Kinston
Southeastern Radio, 408 N. Heritage St.

Raleigh
Southeastern Radio, 414 Hillsboro St.
Womack Supp. Co., 421 S. Salisbury St.

Rocky Mount
Womack Electr., Inc., 105 Marigold St.

Salisbury
Southeastern Radio, 316 No. Depot St.

Shelby
Freck Rad. & Supp., 1503 W. Dixon Blvd.

Wilson
Southeastern Radio, 321 S. Goldsboro St.

Winston-Salem
Dalton-Hege Radio Supp., 938 Burke St.
Womack Radio Supply, 1019 Burke St.

OHIO

Akron
Sun Radio Co., 110 Market St.
Warren Radio Co., 1669 Central Parkway

Chillicothe
Buckeye Electr. Distr., 28 E. Water St.

Cincinnati
Herringer Distr., 112 E. Liberty St.
Hughes-Peters, 1128 Sycamore
Mytronic Co., 2145 Florence Ave.
United Radio, Inc., 3139 Harrison Ave.
United Radio, Inc., 1314 Vine St.
Warren Radio Co., 1669 Central Parkway

Cleveland
Pioneer Electr. Supply., 17011 Broadway
Pioneer Electr. Supp., 5403 Prospect Ave.
Pioneer Electr. Supp., 2115 Prospect Ave.
Radio & Electr. Pts., 3235 Prospect Ave.
Warren Radio Co., 5000 Prospect
Winteradio Electronic, 4432 Mayfield Rd.
Winteradio, Inc., 1468 W. 25th St.

Columbus
Buckeye Electronics, 242 E. Long St.
Hughes-Peters, Inc., 481 E. 11th Ave.
Thompson Radio Supp., 182 E. Long St.

Dayton
Srepco, Inc., 314 Leo St.
Stotts-Friedman Co., 108 N. Jefferson St.

Hamilton
Srepco, Inc., 145 Highland

Lima
Warren Radio Co., 539 W. Market St.

Lorain
Pioneer Electr. Supply, 1648 Broadway

Mansfield
Wholesaling, Inc., 775 Springmill Rd.

Middletown
Srepco, Inc., Plymouth and Brentwood

Newark
Buckeye Electr. Distr., 114 Union St.

Parma
Winteradio Electr. Supp., 5359 Ridge Rd.

Portsmouth
King & Irwin, 1201 9th St.

Springfield
Standard Radio S'field, 1300 St. Paris Rd.

Toledo
Warren Radio Co., 1002 Adams St.

Warren
D & J Electr. Supp., 207 Elm Rd., S.E.

Zanesville
Buckeye Electr. Distr., 120 S. 8th St.
Thompson Radio Supp., 110 S. 6th St.

OKLAHOMA

Ada
Johnson Whsle. Electr., 231 No. Francis

Ardmore
Johnson Wholsale Electr., 709 Grand Ave.

Bartlesville
Norman Electr. Supp., 101 W. 2nd St.

Enid
Johnson, 4108 N. Independence

Oklahoma City
Electronic Supply Co., 212 N.W. 10th St.
Johnson Whsle. Electr., 927 N.W. 1st St.
Radio Supply, Inc., 724 N. Hudson St.

Tulsa
Radio, Inc., 1000 S. Main
S & S Radio Supp., 537 S. Kenosha Ave.

OREGON

Eugene
Hay & Carman, Inc., 768 Lincoln St.
Lou Johnson Co., Inc., 201 E. 8th St.
United Radio Supply, 974 W. 6th Ave.

Medford
United Radio Supply, 605 N. 1st St.
Verl G. Walker, 205 W. Jackson St.

Ocean Lake
Lou Johnson Co., Inc., P.O. Box 484

Portland
Central Distrib., 1331 N.W. Couch St.
Lou Johnson Co., 1506 N.W. Irving St.
Stubbs Electric Co., 33 N.W. Park Ave.
United Radio Supply, 22 N.W. 9th Ave.

Salem
Lou Johnson, 1245 Oxford St., S.E.

PENNSYLVANIA

Allentown
Federated Purchaser, 1115 Hamilton St.
Radio Electric Svce. Co., 1313 Linden St.

Altoona
D & H Distr., Commerce Pk.—Blair County

Ambridge
Television Parts Co., 1109 Merchant St.

Bethlehem
Radio Elec. Svce. Co., 514 W. Broad St.

Bloomsburg
Alvo Electr., 301 W. Main St.

Butler
Television Parts Co., 234 E. Cunningham

Chester
A. C. Radio Supp. Co., 126-28 E. 24th St.

Easton
Federated Purch., 925 Northampton St.
Radio Elec. Svce., 1700 Northampton St.

Harrisburg
D & H Distr. Co., 2525 N. 7th St.
Radio Distr. Co., 915 S. 13th St.

Hazelton
Moyer Electronic, 758 N. Locust St.

Lancaster
Geo. D. Barbey Co., 622 Columbia Ave.

Lebanon
Geo. D. Barbey Co., 821 Quentin Rd.

Lewiston
Alvo Electr., 207 W. Market

Lock Haven
Alvo Electr., 801 Bellefonte Ave.

New Brighton
Television Parts Co., Inc., 518 5th Ave.

New Castle
Television Parts Co., 917 Moravia

Norristown
Phila. Electronic Inc., 624 W. Airy St.

Philadelphia
A. C. Radio, 1539 W. Passyunk Ave.
Consolidated Radio Corp., 612 Arch St.
Herbach & Rademan, 1204 Arch St.
Phila. Electronics, Inc., 1225 Vine St.
Radio Electric Svce. Co., 7th & Arch Sts.
Radio Elec. Svce., 3412 Germantown Ave.
Radio Electric Svce., 5930 Market St.
A. Steinberg & Co., 2520 N. Broad St.
A. Steinberg & Co., 6324 Sackett St.
Eugene G. Wile, 218 S. 11th St.

Pittsburgh
Cameradio Co., Inc., 1121 Penn Ave.

Pottstown
Geo. D. Barbey, 157 N. York St.

Pottsville
Moyer Electr., 330 E. Norwegian St.

Reading
George D. Barbey Co., 2nd & Penn Sts.

Scranton
Fred P. Pursell 1221-27 N. Washington

State College
Alvo Electr., 103 S. Pugh St.

Sunbury
Moyer Electr. Supply, 310 N. 2nd St.

Uniontown
Zimmerman Wholsalers, 104 W. Peter St.

Upper Darby
A. Steinberg & Co., 239 Fairfield Ave.

West Chester
West Chester Elec., 716 E. Market St.

Wilkes-Barre
Shelborne Electr., Inc., 169 N. Penna Ave.

Williamsport
Alvo Electr., 123 E. 4 St.

Willow Grove
Radio Electric Service Co., 29 York Rd.
A. Steinberg, Lincoln Ave. & No. York Rd.

York
Radio Elec., 1114 Roosevelt Ave., Ext.
Wholesale Radio Pts., 1650 Whiteford Rd.

RHODE ISLAND

Providence
William Dandreta, 28 Wolcott St.
DeMambro Radio, 1290 Westminster St.

SOUTH CAROLINA

Charleston
Radio Laboratories, 475 E. Bay St.
Wholesale Radio Supply, 515 E. Bay St.

Columbia
Southeastern Radio, 1606 Gregg St.

Conway
Southern Electronics, 205 Laurel St.

Florence
Southern Electronics, 355 N. Irby St.

Greenville
Carolina Radio Supply, 221 W. Wash'gton

Sumter
Southern Electronics, 8 E. Hampton Ave.

SOUTH DAKOTA

Aberdeen
Burghardt Radio Supp., 102 So. 2nd St.

Rapid City
Burghardt Radio Supp., 403 Sturgis

Sioux Falls
Burghardt Radio Supp., 208 N. Weber
Warren Radio Supply, 115 So. Indiana

Watertown
Burghardt Radio Supp., Inc., 12 N. B'way.

TENNESSEE

Chattanooga
Specialty Distributing, 1313 Central Av.

Dyersburg
Warren Radio Co., 1216 St. John Ave.

Jackson
Lavender Radio & TV, 249 E. Deaderick

Johnson City
Chemcity Radio & Elec., 808 Buffalo St.

Kingsport
Chemcity Radio, 1019 Bristol Highway
Radio Electric Supp., 961 E. Sullivan St.

Knoxville
Bondurant Bros., Co., 906 Sevier Ave.
Chemcity Radio, 2211 Dutch Valley Rd.
Industrial Electronics, 203 So. Gay St.

Memphis
Glen Allen Co., 1150 Union Ave.,
Bluff City Distributing, 234 East St.
Lavender Radio Supply, 180 S. Cooper St.
W & W Distributing Co., 644 Madison
Warren Radio Co., 2122 Madison Ave.

Nashville
Electra Distributing Co., 1914 W. End Ave.
Randolph & Rice, 1213 McGavock St.

Union City
Bluff City — Union City, 306 S. 2nd Ave.

TEXAS

Abilene
Graybar Electric, 1601 S. Treadway

Amarillo
Graybar Electric Co., 601 E. 2nd Ave.
Nunn Electric Supply, 119 Polk St.
R & R Electronic Co., 707 S. Adams
West Texas Electronics, 1601 W. 3rd St.

Arlington
Graybar Electric Co., 104 N. Collins

Austin
Graybar Electric Co., Inc., 214 E. 3rd St.
Hargis-Austin, Inc., 410 Baylor

Beaumont
Sterling Electronics, 1160 Laurel

Big Springs
Lavender Electronics, 401 E. 2nd St.

Bryan
Sterling Radio Products, 2615 Texas Ave.

Corpus Christi
Electronic Equipment, 805 S. Staples St.

Dallas
Adleta Co., 1914 Cedar Springs
Crabtree's Wholesale Radio, 2608 Ross
Graybar Electric Co., 717 Latimer St.

El Paso
Graybar Electric Co., Inc., 3513 Rosa St.
Midland Specialty Co., 500 W. Paisano Dr.
R & R Supply Co., 2531 E. Yandell Dr.
Sunland Supply Co., 1200 E. Missouri Ave.

Fort Worth
Graybar Electric Co., Inc., 1107 Foch St.

Greenville
Lavender Radio & TV Supp., 3418 Lee St.

Houston
Lenert Company, 1420 Hutchins
Sterling Electronics, 1616 McKinney Ave.
Walsh & Co., 4301 Gulf Freeway

Kilgore
Lavender Radio Supply, 906 S. Broadway

Kingsville
Lavender Radio & TV, 121 N. 7th St.

Lubbock
Nunn Electric Supply, 1817 4th St.
R & R Supply Co., Inc., 1607 Ave. G
West Texas Electronics, 1964 Texas Ave.

Lufkin
Sterling Radio Products, 428 Atkinson

Midland
West Texas Electr., 1903 W. Industrial

Odessa
Graybar Electric Co., Inc., 900 E. 2nd
Midland Specialty, 2101 Andrews-H'way

Orange
Ralph's Radio-Electr. Supp., 306 Border

Paris
Lavender Radio Supply, 250 S. Main

San Antonio
Graybar Electric, 1223 N. Hackberry St.

Sherman
Lavender Radio Supply, 308 E. Houston

Tyler
Lavender Radio Supply, 503 E. Oakwood

Victoria
Lavender Radio & TV, 1005 N. Williams

Wichita Falls
R & R Electronic Co., 1300 12th St.

UTAH

Salt Lake City
Moore Radio Supply, Inc., 147 E. 6th St.
S. R. Ross, Inc., P.O. Box 1055
Standard Supply Co., P.O. Box 1047

VERMONT

Burlington
Radio Service Laboratory, 703 Pine St.

St. Johnsbury
DeMambro Radio Supply, 52 Portland St.

VIRGINIA

Alexandria
Certified Electronics, 1313 Powhatan St.

Arlington
Key Electronics, 100 S. Wayne
Rucker Electr., 1213 Wilson Blvd.

Charlottesville
Virginia Radio Supply, 715 Henry Ave.

Danville
The Womack Radio Supply, 513 Wilson St.

Martinsville
Womack Radio Supply, 324 Memorial

Norfolk
Priest Electronics, 6431 Tidewater Dr.
Radio Supply Co., 711 Granby St.

Portsmouth
Distributors, Inc., 710-12 County St.

Richmond
Meridian Electronics, 1001 W. Broad St.
Radio Supply Co., Inc., 3302 W. Broad St.

Roanoke
H. C. Baker Sales Co., 19 W. Franklin Rd.
Radio Supply Co., 2009 Williamson Rd.

Winchester
Kann-Ellert of Virginia, 1650 Valley Ave.

WASHINGTON

Bellingham
Pringle Radio Wholesale, 204½ Unity St.

Everett
Pringle Radio Wholesale, 2101 Colby Ave.

Mt. Vernen
Pringle Radio Wholesale, 822 N. 4th St.

Seattle
Seattle Radio Supply, 2117 2nd Ave.
Western Electronic, 717 Dexter Ave.
Westlake Electronic, 509 Westlake North

Wenatchee
Mid-State Rad. Supp., 611 N. Wenatchee

Yakima
Seattle Radio Supply, 312 S. 3rd Ave.

WEST VIRGINIA

Beckley
Chemcity Electr. Distr., 1708 S. Kanawha

Charleston
Chemcity Electr. Distr., 1637 4th Ave.
Mountain Electronics, 708 Bigley Ave.

Clarksburg
Chemcity of Clarksburg, 414 No. 5th St.
Mountain Electronics, 720 W. Pike St.

Huntington
Electronic Supply, Inc., 422 11th St.
King & Irwin, 314 11th St.
Mountain Electronics Co., 1127 3rd Ave.
Warren Radio Co., 800 8th St.

Point Pleasant
Chemcity Electronics, 233 Main St.

West Logan
King & Irwin, Inc., P.O. Box 328

WISCONSIN

Green Bay
Northern Radio & TV Co., 1585 Main St.

La Crosse
Stark Radio Supply Co., 131 So. 6th St.

Madison
Satterfield Electr., 1900 S. Park

Milwaukee
Radio Parts Co., Inc., 1314 N. 7th St.

Portage
Satterfield Electr., 109 W. Mullett

Wisconsin Rapids
Satterfield Electr., 1900 8th St., So.

CANADA

Montreal
Atlas Wholesale Radio, 4985 Buchan St.
Excel Distributing, 8601 St. Lawrence
Payette Radio, Ltd., 730 St. James W.

New Westminster, B. C.
Taylor, Pearson & Carson, Ltd.

Quebec
Crobel Ltd., 225 Rue Lee
Excel Distr. Inc., 864 Blvd. Charest

Toronto
Electro Sonic Supply, 543 Yonge St.
Radio Essentials, 1671 Lake Shore Rd.

Vancouver
Taylor, Pearson & Carson, 1006 Richards
L. A. Varah, Ltd., 1451 Hornby St.

Victoria, B. C.
Taylor, Pearson & Carson, Ltd.

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- Receiving Tubes
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Finite Electrical Tolerance Guarantees Infinite Superiority in Performance!

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Long Island City, N. Y.

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PRODUCT LITERATURE

(Continued from Page 75)

MINIATURE BALL BEARINGS **Sec. 2500**

Catalog 4E gives dimensional data on inch, metric, pivot and special series of RMB miniature ball bearings. In addition to illustrations and drawings, part numbers of other manufacturers' bearings interchangeable with the inch series are listed. *Landis and Gyr, Inc., 45 W. 45th St., Dept EP, New York 36, N. Y.*

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OPTICAL & PHYSICAL TEST EQUIPMENT **Sec. 2900**

This manufacturer's line of optical and physical test equipment for paint, paper, plastics, ceramics, leather, oil, rubber and other materials are contained in this 28-page bulletin. Applications, detailed descriptions and prices are included. Bulletin announces the manufacturer's general catalog listing the complete line of instruments and apparatus. *Gardner Laboratory, Inc., P.O. Box 5728, Dept EP, Bethesda 14, Md.*

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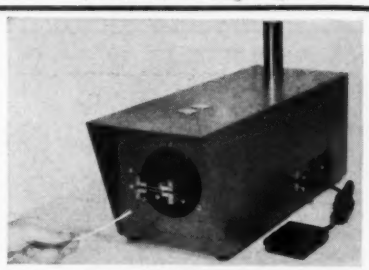
(Continued on Page 84)



NEW

AUTO-THERM WIRE STRIPPER

for Semi-Automatic Stripping

Strips Fiberglass, Teflon, Vinyl, cotton, Nylon, etc. Any size to ⅜" diameter including coax, shielded, irregular-shaped. Has solenoid-actuated operation. Rotating head strips hard-to-remove insulation. Capacity in excess of 1000 ends per hour. Heated elements sever the insulation. Cannot nick or cut the finest wire strands. Tension adjustment eliminates crushed wire. Built-in ventilating system.

Price $395 FOB Altadena, Calif.

Western Electronic Products Co.
2420 North Lake Avenue, Altadena, Calif.

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MEASURE TOTAL HARMONIC CONTENT OF *A C* SIGNALS!

ORTHO DISTORTION ANALYZER
FILTER, SERIES **DA**

Passive device permits measurement of total RMS harmonic distortion of a specific fundamental frequency. Any standard high impedance vacuum tube voltmeter which has a flat frequency response to the tenth harmonic of the fundamental measured, can be used to effect the measurement.

SPECIFICATIONS

Fundamental rejection	75 db minimum
Fundamental bandwidth	±3%
Useful distortion range	05% to 20%
Harmonics measured	2nd to 10th ±.5 db
Input level	10 volts max. (higher voltages available on special order)
Overall dimensions	5¾" x 3" x 2"
Standard frequencies	400 cycles, 800 cycles, 1000 cycles
Non-standard frequencies	50 cycles to 50,000 cycles
Delivery	Immediate delivery on stock models; 2-week delivery on custom-built models.

Write today for full details!

of ortho filter CORPORATION
A Subsidiary of ORTHO INDUSTRIES, INC.
7 PATERSON ST.• PATERSON 1, N. J.• MU 4-5858

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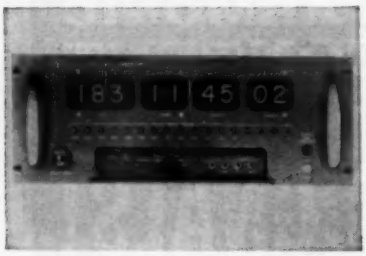
TIME CODE GENERATOR [*Electronic Engineering Co. of Calif.*]

eem File System Sec. 5200

Supplies All Four IRIG Formats



Both digital and resolver time shifts are provided for fast accurate synchronization with WWV by the EECO 811 time code generator. The instrument supplies IRIG formats A, B, C, and D in addition to parallel code output, 10-pps and 1-pps synchronizing pulses.

Frequency stability of the unit is one part in 10^8 per day under laboratory temperature conditions or 3 parts in 10^8 over wider temperature limits.

Separate digital controls permit resetting the time of day and day of the year. The BCD and binary codes are set simultaneously. Interlock controls eliminate accidental stopping of the accumulator. Short circuiting of any of the outputs will not cause damage to the unit.

Power requirement is 115 vac, 50 to 400 cps at 1 amp.

PRICE: $9,750.00. **AVAILABILITY:** 60 to 90 days. **MFR:** Electronic Engineering Co., of Calif., 1601 East Chestnut Ave., Dept EP, Santa Ana, Calif. **SALES OFFICES:** See **eem** p. 1712 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 673-675, 856

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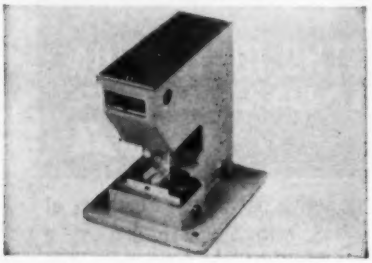
MYLAR FILM PUNCH [*Wems, Inc.*]

eem File System Sec. 5400

Speeds Module Assembly



Mylar films used in the fabrication of resistance-welded electronic modules and interconnecting matrices can be punched with the MP-100 Mylar film punch to accommodate component lead wires from 0.016″ to 0.125″ diameter.

Solenoid actuated (60 cps, 110 volts) by a foot-operated switch, the punch can be used by non-skilled personnel. A built-in light at the base illuminates the die hole, facilitating alignment of the punch and the desired hole location.

Standard punch and die sets are available with 0.016″, 0.021″, 0.028″, 0.040″, 0.062″, and 0.125″ diameter.

The cast aluminum housing has a 5″ x 6″ base; unit is 8″ high x 2″ wide x 5″ deep and weighs 8 pounds. Punches are made of ground, hardened steel.

PRICE: $390.00 (die sets: $30.00). **AVAILABILITY:** From stock. **MFR:** Wems, Inc., 4807 W. 118 Place, Dept EP, Hawthorne, Calif. **SALES MGR:** G. Rove, OS 9-2248; for nearest rep see **eem** p. 1882 (961-62 Ed.)

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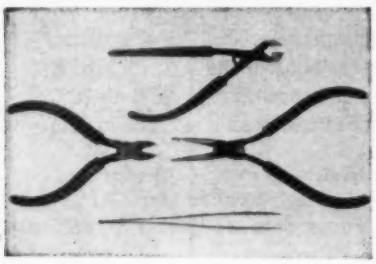
WIRE AND RIBBON CUTTERS [*Sippican Corp.*]

Specifically Designed For Welded Electronics Fabrication



Manufactured from tarnish-resistant tool steel, each cutter in this kit is hand filed and honed, and has flush edges with cutting action at the tip of the tool.

The tools can be used with conductor and lead wires up to 0.025-inch half-hard nickel. Tweezers are made from non-magnetic, brush-finished, stainless steel (Model 104 smooth tip, Model 104S serrated tip).

Supplied in a plastic carrying case, the kit contains one each: Model 101 matrix cutter (top); Model 102, component lead cutter (right); Model 103 utility cutter (left); and Models 104 and 104S tweezers (bottom). Model 101 is for minimum clearance (0.050-inch center-to-center) clipping of parallel wires. Model 102 is for clipping of excess component leads. Model 103 is for wire and ribbon preparation and terminal lead clipping. Units are available as single pieces.

PRICE: $35.00 (kit). **AVAILABILITY:** From stock. **MFR:** Sippican Corp., Box 537, Dept EP, Marion, Mass.

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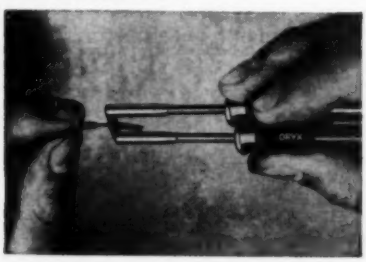
THERMAL WIRE STRIPPER [*Oryx Company*]

Tweezer-Like Unit



Thermal wire stripper Model ST-6 is usable with a variety of insulating materials and with widely varying wire sizes.

The tool incorporates separate heating elements in each arm and durable stainless steel stripping heads which have an operating temperature of 480°F.

Compact in size (6″ long) and weighing 2 oz, the unit is effective for modification and repairs in tight places.

The tweezer allows the operator to vary pressure and control without damage to conductors.

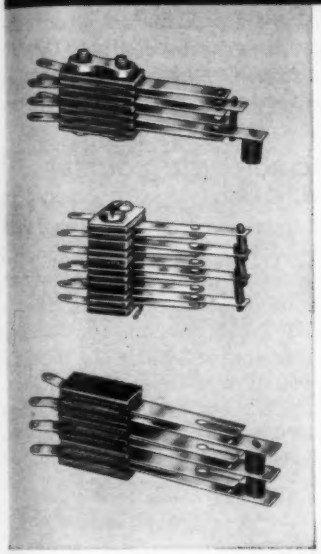
The device requires a 6-v, 3-amp a-c or d-c power supply and power consumption is 12 watts.

Compact 6-volt transformers are available for use with the device.

PRICE: $14.95. **AVAILABILITY:** From stock. **MFR:** Oryx Co., 13804 Ventura Blvd., Dept EP, Sherman Oaks, Calif. **SALES OFFICES:** See **eem** p. 1802 (1961-62 Ed.)

Check **331** *Reader Service Card 11/61*

SWITCHCRAFT® INC.
STACK SWITCHES



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•VERSATILE •DEPENDABLE •ECONOMICAL

A "pile-up" of various contact springs, insulators, contacts, etc., that can be custom-designed into your equipment. Can also be manufactured to your particular specifications.

Now being used in Tape Recorders, Remote TV Control Units, Juke Boxes, Electronic Organs, and innumerable other products requiring dependable switching.

Write for Catalog S-304. Contains a list of parts that can be made from standard tools, to enable you to design a particular Switch to suit your needs.

SWITCHCRAFT® INC.

5587 N. Elston Ave., Chicago 30, Ill.

Canadian Rep: Atlas Radio Corp., Ltd.,
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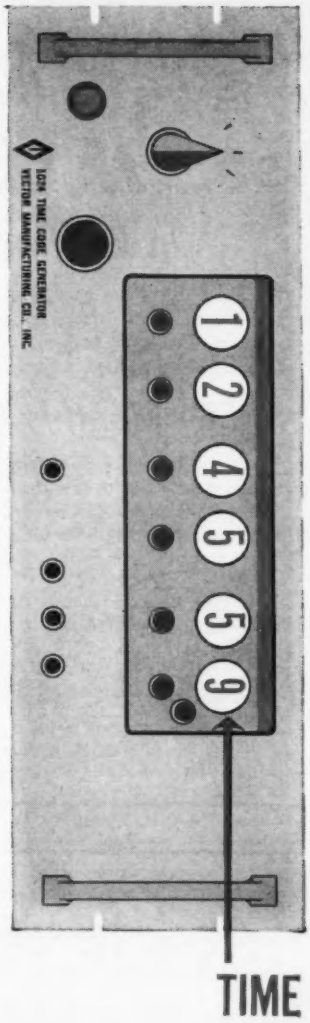

VECTOR 1024 TIME CODE GENERATOR provides pulse code for digital measurements of clock time. Output jackplug allows entry of Real Time into digital systems or computers.

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VECTOR MANUFACTURING CO., INC.
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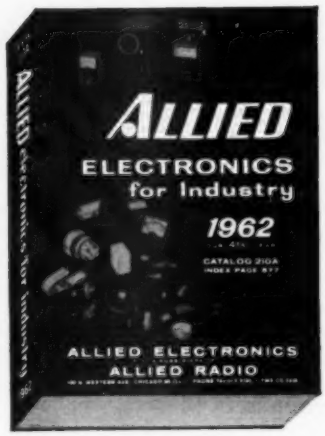

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PRODUCT LITERATURE

(Continued from Page 81)

INSTRUMENT MOTORS Sec. 3500

Bulletin IM-1, a 28-page brochure, contains dimensional drawings, rating charts, wiring diagrams, listings and photographs of instrument motors. Development and testing procedure and applications are included. Requests for the brochure should be made on company letterhead. *Bodine Electric Co., 2500 W. Bradley Pl., Dept EP, Chicago 18, Illinois.*

PRECISION POTENTIOMETER WINDER Sec. 4100

A catalog sheet describes Model 435-AML potentiometer winder, which permits ±7% fine adjustment of nominal pitch. Also described is Model T-435 tension, for winding very fine wire (0.010" to 0.0004") on round mandrels. *Geo. Stevens Mfg. Co., Inc., Pulaski Rd., Dept EP, Pulaski Road at Peterson, Chicago 46, Ill.*

Check **228** *Reader Service Card*

ELECTRICAL CONTACTS Sec. 4500

This two-color, eight-page bulletin includes charts covering applications and technical data for various contact alloys and specifications of most commonly employed stock contacts. Discussed are points to be considered in the design, specification and purchase of rivet contacts, laminated contacts, spring and blade components and complete assemblies. *Tricon Mfg. Co., 8010 S. Wallace, Dept EP, Chicago, Ill.*

Check **229** *Reader Service Card*

SILICON TRANSISTORS Sec. 4800

A comparative study of high-frequency silicon transistors produced by four major manufacturers has been published in a 28-page handbook. Basis of the study was the 2N338, its family of high-frequency silicon units, and their equivalent types in subminiature, single and double-ended packages. A free copy of the handbook may be obtained with a letterhead request. Warren Schoonmaker, *Raytheon Co., Semiconductor Div., 150 California St., Dept EP, Newton, Mass.*

(Continued on Page 85)

PRODUCT LITERATURE

(Continued from Page 84)

ELECTRON TUBE HANDBOOK — Sec. 5700

A 12-page handbook describes 142 miniature vacuum electron tubes for industrial, military, and communications applications. It lists all tube characteristics and diagrams of tube bases and connections.

A special listing of triodes, twin triodes, twin diodes, pentodes, twin pentodes, and twin tetrodes recommended for new equipment design is included. Military specifications and quality control techniques the tubes are required to meet are also discussed. *Raytheon Co., Industrial Components Div., 55 Chapel St., Dept EP, Newton 58, Mass.*

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SHRINKABLE PLASTIC TUBING — Sec. 6000

General description, properties, and complete technical specifications for the manufacturer's line of

(Continued on Page 89)

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We machine-draw tubing to your new dimensions and ship in a matter of hours.

If your problem can be resolved by new dimensions (O.D., I.D., length) or tolerances, call us today for service.

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Garner capacity for millions of parts weekly is built on routine manufacturing to many dimensions in many glass types. Our quality is based on in-plant designed equipment. We can give you tolerance control 366 days a year.

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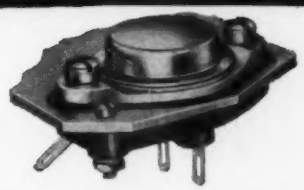
AUGAT POWER TRANSISTOR SOCKETS

Augat Power Transistor Sockets bring you the benefits of maximum heat dissipation by conduction because they allow you to mount semiconductors, with mica insulator, directly to the chassis.

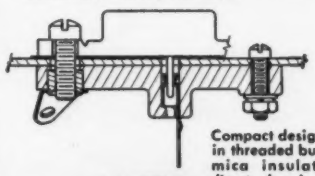
They're molded in your choice of insulating materials; General Purpose Black Phenolic per MIL-M-14, Type CFG; Melamine per MIL-M-14, Type MME; Diallyl Phthalate per MIL-M-18794A (Navy) Type SDG.

Contacts are Spring Temper Phosphor Bronze, electro tin plated. Bushings are Brass per MIL-B-895 (Ships), Nickel plated per QQ-N-290, Class 2. Terminals are Copper, hot tin dipped.

For complete specifications, write for Bulletins 561 and 760.



New socket for JEDEC TO-3 outline power transistors, diodes, rectifiers.



Compact design, molded-in threaded bushings and mica insulator allow direct chassis mounting.

Socket designed for complete series of Clevite Spacesaver Power Transistors.

AUGAT INC. 32 Perry Avenue Attleboro, Mass.

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STRAIN-GAGE TRANSDUCER [*Bourns, Inc.*]

eem File System Sec. 5500 electronic engineers master

Five To 5,000 PSIA Ranges With 0.25% Accuracy

Unbonded strain-gage pressure transducer Model 2521 has diaphragm-actuated strain elements which form a fully active, four-arm Wheatstone bridge. The milivolt/volt output is delivered with wire strain levels considerably lower than conventional instruments, it is said.

Of stainless steel construction, the welded unit has no 0-rings or gaskets exposed to pressure media.

The method of mounting the strain elements virtually eliminates the need for temperature compensation.

Specifications include: pressure ranges 0-5 to 5,000 psia; linearity and hysteresis (combined) less than ±0.25%; zero balance ±1% of full-scale output; thermal zero shift ±0.005%/°F; size ⅞" dia x 3"; weight 5 oz.

PRICE & AVAILABILITY: Contact Sales Offices below. **MFR:** Bourns, Inc., Instrument Div., 6135 Magnolia Ave., Dept EP, Riverside, Calif. **SALES OFFICES:** See **eem** p. 1666 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1308, 1309

Check **332** *Reader Service Card 11/61*

FLUSH-MOUNT TRANSDUCER AND CABLE ASSEMBLY [*Erie Resistor Corporation*]

For Hydrophones—Eliminates Projection Below Boat's Hull

Turbulence and drag at high speeds is minimized by the design of this flush-mount transducer.

The device has a ceramic peizoelectric element attached to a brass plate on one face and the remainder enclosed by a semihard epoxy. This design, it is said, results in excellent coupling yet does not restrict the functioning of the piezoelectric ceramic.

Receiving sensitivity is −85 db vs 1 volt/μbar and transmitting sensitivity is ±85 db vs μbar at 1 yd for 1-w input.

Resonant frequency of the transducer is 195 kc ±10%, its impedance at resonance is approximately 300 ohms.

Maximum transmitting capacity is 50 watts at 10% duty cycle and the unit has a total capacitance of 2,000 pf ±10% with 15 ft. of RG58A/U cable.

PRICE: $6.50 to $10.00 ea (depending on qty). **AVAILABILITY:** 3 to 4 wks. **MFR:** Erie Resistor Corp., 644 West 12th St., Dept EP, Erie, Penna. **SALES OFFICES:** See **eem** p. 1716 (1961-62 Ed.)

Check **333** *Reader Service Card 11/61*

INDUSTRIAL ELECTRON TUBES [*Raytheon Co., Industrial Components Div.*]

eem File System Sec. 5700 electronic engineers master

Lower Noise and Microphonism, Instrumentation Types

This firm's improved line of tubes formerly manufactured by CBS Electronics, Inc., features precision parts in stronger structures for lower noise and microphonism, and life-test controls increased from 500 to 1,000 hours.

Twin-triode 7728 is interchangeable with the 12AT7, the 7729 with the 12AX7 and the 7730 with the 12AU7. All have a maximum grid current of 0.5 μa.

Type 7731, interchangeable with the 6U8, has grid currents of 0.7 μa for its pentode and triode. The 7732, interchangeable with the 6CB6, has a 0.3-μa grid current.

The 7733 is interchangeable with 12BY7 and 12BY7A types; grid current is 0.5 μa and plate current is 19 to 31 ma.

PRICE: $1.87-$2.68 (1-99, depending on type). **AVAILABILITY:** From stock. **MFR:** Raytheon Co., Industrial Components Div., 55 Chapel St., Dept EP, Newton 58, Mass. **SALES OFFICES:** See **eem** p. 1823 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 766, 803, 939, 1293, 1580-1583

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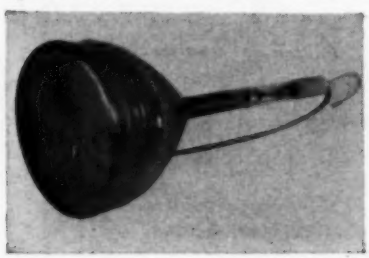
WIDEBAND RADAR DISPLAY TUBE [*Sylvania Electric Products Inc.*]

Operates Without TR Device or Auxiliary Equipment



For use in high-resolution radar systems, the Wamoscope (wave-modulated oscilloscope) has a bandwidth of 100 to 10,000 mc and can be modified for operation at higher frequencies.

Combined in one vacuum envelope are a detector, amplifier and cathode-ray-tube display. Performing all the functions of a conventional radar receiver, it aids achieving of simplicity and light weight in portable equipment.

A beam-focusing system and power supplies are the only auxiliary equipment required for operation of this device.

The tube can be furnished in cathode-ray-tube envelopes of any standard size, shape and phosphor coating.

In an airport surface radar, the short-range capability of the tube permits close monitoring of taxi strips, parking areas, and runways.

PRICE: $2,500.00 ea (single units). **AVAILABILITY:** Contact Mfr below. **MFR:** Sylvania Electric Products Inc., 1100 Main St., Dept EP, Buffalo 9, N. Y.

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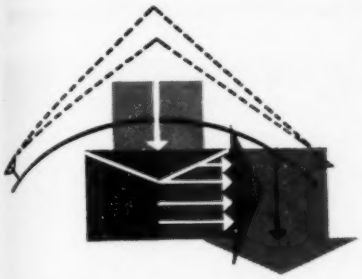
FLEXIBLE
VERSATILE
HIGH SPEED



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to transmit digital data up to 2400 bits/second over H-F radio single-side band circuits using existing multiplex equipment.

Now you can use your H-F radio teletype circuits for high speed, synchronous data transmission—600 to 2400 bits/second: card to card, magnetic tape to tape, punched paper tape to tape or other special serial data system—by employing groups of channels and distributing the high speed data in accordance with TTY channel capacity. You also obtain the significant advantages of Synchronous clocked detection to provide enhanced transmission reliability.

ADVANTAGES

1 Retain present TTY multiplex equipment.
2 Add flexibility for expanding service of present terminal equipment where current investment lies.
3 Add versatility to future TTY multiplex equipment.
4 Provides means for intermixed TTY and High Speed data.

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ADJUSTABLE POLYSTYRENE CAPACITORS

ADJUST-A-CAPS, the new polystyrene capacitors from Chicago Condenser Corporation, are adjustable from —1% to +1% of normal capacitance. Precision drawn cases, heavy-duty porcelain terminal insulators, and stringent quality control manufacturing insure optimum operation under wide range of environmental conditions. **Stabilized close tolerance** bathtub polystyrene capacitors with Tolerances of 1%, 0.5%, 0.25% and 0.1% plus stability of better than 0.1% per year are also available.

For complete specifications, write direct.

CHICAGO CONDENSER CORPORATION
3255 West Armitage, Chicago 47, Illinois

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- Special "dustless" process for clean handling of electronic and other delicate parts.
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- Built-in durability yet tissue thin for superior finger dexterity.

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BOOK REVIEWS

FUNCTIONAL CIRCUITS AND OSCILLATORS

By HERBERT J. REICH, Van Nostrand Co., Princeton, N. J., 1961, 466 p., $12.50

Reviewed by Anthony B. Giordano, Dean of the Graduate School, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

This comprehensive text, part of the Van Nostrand Series in Electronics and Communications, meets a definite need for a clear analysis of modern electric devices. It presents a thorough analysis and description of special circuits common to several fields of modern electronic technology — such as television, computers, control systems, instrumentation, and others. In these newer fields, developed techniques utilize a wide variety of circuits and devices which perform unusual functions (summing, clipping-clamping, amplitude comparison, etc.) as well as a wide variety of signal sources (multivibrators, blocking oscillators, sinusoidal oscillators, etc.)

The presentation is oriented towards principles and criteria basic to the problem of synthesizing circuits to satisfy unique requirements and elaborate mathematical derivations are avoided. The stress is on methods of attaining specific characteristics.

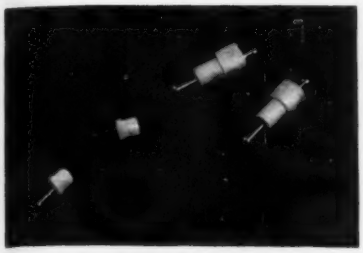
In particular, the text is divided into 93 sections. Each section concerns itself with a class of functions and related circuits involving both tubes and transistors. Significant parameters and their influences are carefully explained. Most of the sections contain a listing of references for further reading. Typical section headings are, for example: Circuits for the Addition of Voltages; Circuits for the Subtraction of Voltages; Differentiating and Integrating Circuits. Such a format provides quick accessibility to desired information.

The principal topics, in addition to those already mentioned, evolve around pulse amplifiers, astable circuits, bistable circuits, counting circuits, differential amplifiers, characteristics of tubes and semiconductor devices, electronic switches, monostable circuits, pulse amplifiers and oscillators of all types. The field of sinusoidal oscillators is treated in a penetrating manner in the last 22 sections of the text under two broad classes, negative-resistance oscillators and feedback oscillators. Considered are power output, harmonic content, frequency stability, amplitude stability, accuracy of calibration, and design limitations. Of particular value is the discussion relating to criteria of oscillations of various types of configurations, including the null-network and phase-shift network. A list of problems is located in the appendix. The problems have been selected to augment the basic value of the material described throughout the text.

The text has been designed to provide the reader with useful practical knowledge normally available in the periodical literature but difficult to extract. It will therefore prove to be of great value to students, scientists, and engineers who find themselves baffled by the scattered nature of the literature. The author is to be commended for his lucid exposition and neat format.

microdot hardware

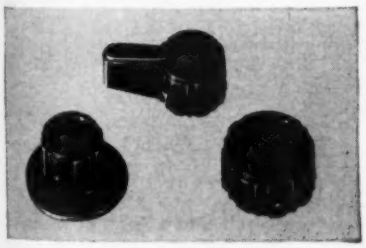
Lerco "Teflon" Terminals



A complete line of insulated terminals in miniature and subminiature stand-offs and feed-thrus, receptacles, plugs, jacks, and probes is available "off-the-shelf" from Microdot's Lerco Division. Uncontaminated "Teflon" is used exclusively for the insulating bushing. These precision manufactured terminals withstand temperatures from -100°C to +250°C, are resistant to vibration and corrosion, and are unaffected by solvents, acids, or bases. Available in white and a variety of color codes.

Microdot Inc., 220 Pasadena Avenue, South Pasadena, California

Lerco Custom Knobs



Precision molded knobs of high impact styrene meet mil-spec requirements. Modern functional designs are available in mirror or matte finish, blue, grey or black, with anodized aluminum inserts and two positive grip set screws. Popular sizes and configurations are available "off-the-shelf." Custom designs, sizes, and special colors are furnished on special order.

Microdot Inc., 220 Pasadena Avenue, South Pasadena, California

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PRODUCT LITERATURE

(Continued from Page 85)

shrinkable plastic tubing are included in a four-page brochure. Methods of heating to provide a snug-fitting protective cover for various types of components and objects are included. *L. Frank Markel & Sons, Dept EP, Norristown, Pa.*

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NICKEL CHROMIUM ALLOY WIRE **Sec. 6000**

A data sheet furnishes information on CRM B-800, a nickel-chromium wire providing greater ease of soldering and reduced noise level in potentiometer applications.

Offered in diameter sizes from 0.010" down to 0.00045" (other diameters supplied on special order), the alloy has a temperature coefficient of resistivity of ±5 ppm (−55°C to 125°C), high tensile strength (min 130,000 psi to max 180,000 psi), and low thermal emf against copper of 1 microvolt/°C (0°C to 100°C). *Consolidated Reactive Metals, Inc., 115 Hoyt Ave., Dept EP, Mamaroneck, N. Y.*

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- Provision for zeroing
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- Scales of 0° to 360° or 0 to 100

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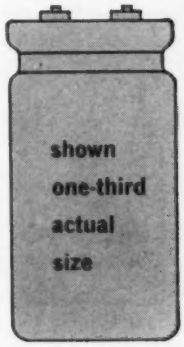

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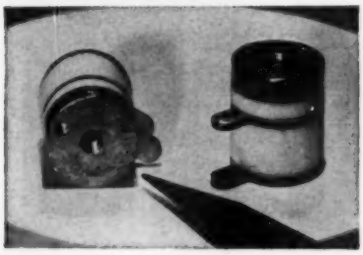
CERAMIC VOLTAGE-REGULATOR TUBE [*General Electric Company*]

eem File System Sec. 5700 electronic engineers master

Has Vibration-Proof Mounting



Maintaining output voltage constant to within ±2 volts throughout its entire ambient temperature range of −65°C to 400°C, this ceramic voltage-regulator tube has application in aircraft and missiles.

Type ZR-7501 operates at a design point of 103 v over a current range of 5 to 100 ma. Its d-c starting voltage is 150 v maximum.

The two-electrode, cold-cathode tube weighs 0.4 oz and is 0.7" in diameter and 0.75" long.

A vibration-proof mounting provides insulation to 1,500 v to ground. The tube's shock rating is 50 g for 11 millisec, and its vibration rating is 20 g at 2,000 cycles.

This tube can be used as a voltage regulator in control circuits operating near nuclear reactors because the ceramic materials used are highly resistant to nuclear radiation.

PRICE: $132.00 (sample qty). **AVAILABILITY:** From stock. **MFR:** General Electric Co., Dept EP, Schenectady 5, N. Y.

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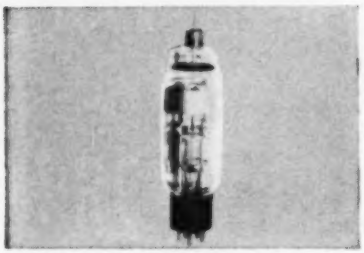
MERCURY VAPOR RECTIFIERS [*National Electronics Inc.*]

Filament Heating Time 30 Seconds



High-voltage mercury-vapor rectifier type NL-RX21A (illustrated) and type NL-KY21A, a high-voltage mercury-vapor grid-controlled rectifier or thyratron, are designed for industrial high voltage power-rectifier applications.

Both devices are rated at 0.75 ampere dc and 11-kv peak inverse voltage.

Other common ratings include: filament volts, 2.5; filament current, 10 amp; peak anode current, 3 amp; condensed mercury temperature limits of 20°C to 60°C.

Typical anode starting voltage for the NL-RX21A tube is 13 volts and 50 volts for the NL-KY21A.

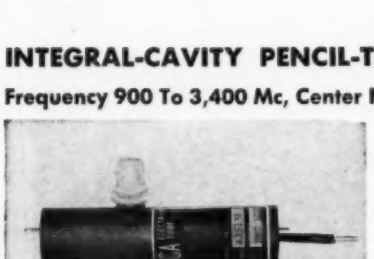
Mounting position for both rectifiers is vertical, base down; their net weight is 4 ounces each.

PRICE: $25.75 ea. **AVAILABILITY:** From stock. **MFR:** National Electronics, Inc., Sub. of Eitel-McCullough, Inc., 628 North St., Dept EP, Geneva, Ill. **SALES MGR:** H. W. A. Chalberg, CE 2-4300; for nearest rep see **eem** p. 1794 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1578

Check **337** *Reader Service Card 11/61*

INTEGRAL-CAVITY PENCIL-TUBE OSCILLATORS [*Radio Corp. of America*]

Frequency 900 To 3,400 Mc, Center Frequencies 150, 300 Or 350 Mc Wide



Types A15219 through A15236 are oscillators employing tunable cavity resonators and pencil-tube triodes; c-w types provide up to 1.5 watts at 900 mc and 50 mw at 3,400 mc. Plate pulse types provide up to 800 watts peak at 900 mc and 50 watts at 3,400 mc, with a duty cycle of 0.001.

Oscillators operate in specific frequency bands of 150, 300 or 350 mc wide. Units are factory adjusted. Oscillators with a center frequency below 1,900 mc can be tuned ±25 mc from the center frequency in the field. Oscillators with a center frequency above 1,900 mc can be tuned ±50 mc from the center frequency in the field.

As microwave signal sources, units feature small size, light weight, ruggedness, long life and efficiency in addition to simplicity of operation.

PRICE: $95.00-$185.00. **AVAILABILITY:** From stock. **MFR:** Radio Corporation of America, Electron Tube Div., Dept EP, Harrison, N. J. **SALES OFFICES:** See **eem** p. 1820 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** p. 1579

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DUAL-GUN 10-INCH STORAGE TUBE [*Allen B. DuMont Laboratories*]

Adaptable To Missile And Satellite Tracking—Deflection Linearity ±0.5%

Achieving deflection linearity within 1% (no deflection plate current), Type K2087 Storatron features excellent tracking accuracy between guns and raster orthogonality without on-axis writing.

Advantages of its dual guns are the ability to track from two separate antennas or two angles or points. Storage time of the tube is from 3 to 10 minutes. The tube is adaptable to tv frequencies and can freeze tv presentations with excellent light output.

Writing speed is 200,000 inches per second at 40 lines per inch resolution and 50 foot lamberts light output.

Other advantages are a deflection system unaffected by the viewing gun current and compatibility with high impedance deflection circuits.

PRICE: $2,850.00-$3,300.00. **AVAILABILITY:** 6-8 wks. **MFR:** Allen B. DuMont Laboratories, Divs. of Fairchild Camera & Instrument Corp., Electronic Tube Div., 750 Bloomfield Ave., Dept EP, Clifton, N. J. **SALES OFFICES:** See **eem** p. 1701 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1556, 1557

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1 μv to 1000 volts

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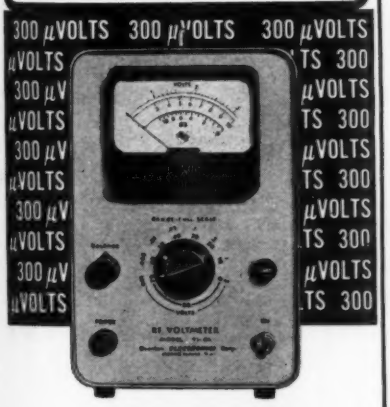

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(Actual Size)

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- √ Two-dimensional thermal junction for accurate location of point of measurement.
- √ Thermocouple constructed of flat ribbon wires and mica insulation.

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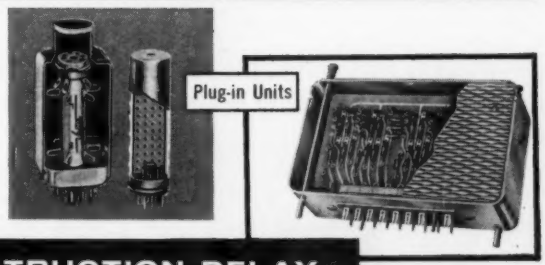

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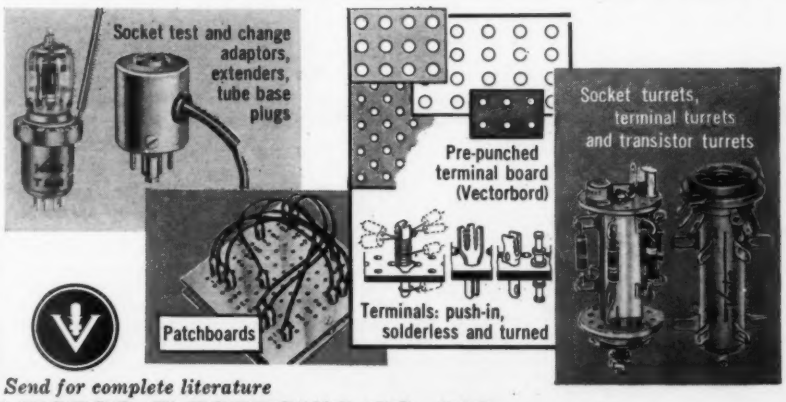
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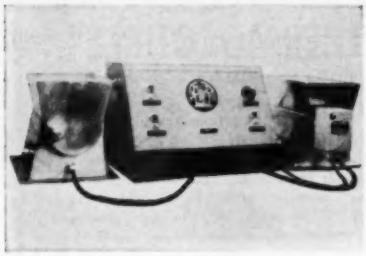
ULTRASONIC CLEANERS [*B. M. Harrison Electrosonics, Inc.*]

eem File System Sec. 5800

Permit Choice Of Detergents Or Use Of Plain Water



Series 751 ultrasonic cleaners produce a 200-kc sinusoidal output up to the cavitational level.

The cleaners operate with a power output of 700 watts peak with input requirements of 115 v at 8 amp, 60 cps, single phase and can be supplied with one of two different types of transducer tanks; the smaller is 1¼ gallons and the larger is 2½ gallons. The generator will drive two tanks of the 1¼-gallon size or one of the 2½-gallon size.

Keeping the liquid in physical contact with the transducer eliminates need for a steel barrier between transducer and liquid.

The unit has an efficiency of approximately 70% and can be used for production line cleaning of parts or as a research tool in the laboratory.

PRICE: With thermostatically controlled tank $695.00 (1¼ gal); $795.00 (2½ gal). **AVAILABILITY:** From stock. **MFR:** B. M. Harrison Electrosonics, Inc., 80 Winchester St., Dept EP, Newton Highlands 61, Mass. **SALES MGR:** Melvin Cowan, DE 2-6350

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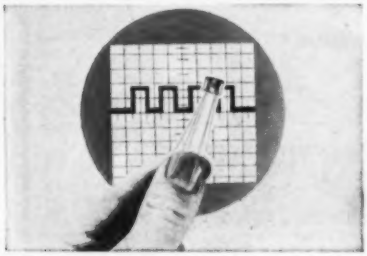
MICROMINIATURE SILICON CHOPPER [*Solid State Electronics, Co.*]

eem File System Sec. 5900

Electrostatically Shielded—Temperature Range −55° To 150°C



Encapsulated within a TO-5 metal transistor enclosure, the Microchopper Model 5 provides linear switching or chopping of voltages over a dynamic range from a fraction of a millivolt up to ±20 volts.

Unlike mechanical choppers which can only operate over a narrow and comparatively low frequency range due to mechanical limitations, this transistorized chopper is an inertia-less device than can be driven from dc to 100 kc.

Practically immune to the effects of shock and vibration, the chopper is suitable for military, missile, and portable applications. It has an inherently long life and is not subject to contact bounce, wear, pitting or burning.

PRICE: $82.00. **AVAILABILITY:** From Stock. **MFR:** Solid State Electronics Co., 15321 Rayen St., Dept EP, Sepulveda, Calif. **SALES MGR:** E. Politi, EM 4-2271; for nearest rep see **eem** p. 1824 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1299, 1602

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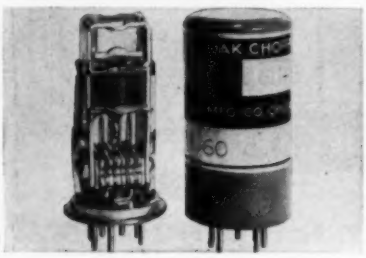
MINIATURE 60-CYCLE CHOPPER [*Oak Manufacturing Company*]

Minimizes Chassis Vibration



A lightweight moving element and armature reduce audible noise of this improved chopper and minimizes vibration transmitted to chassis mounted tubes.

For use in operational d-c amplifiers for computer applications, its nominal drive frequency and voltage are 60 ±5 cps at 6.3 volts, aperiodic over the range from 10 to 100 cps.

Phase lag at nominal drive frequency and voltage is 20° ±5° at 60 cps (25°C). Contact dwell time at nominal drive frequency and voltage is 160°-165° at 60 cps.

Noise, depending on circuitry, is 5 microvolts to 50 microvolts rms.

A heavy shield reduces magnetic pick up due to ground currents in many chassis arrangements.

PRICE: $22.85 ea. **AVAILABILITY:** Contact Sales Offices below. **MFR:** Oak Manufacturing Co., Dept EP, Crystal Lake, Ill. **SALES OFFICES:** See **eem** p. 1800 (1961-62 Ed.) **OTHER PRODUCTS:** See **eem** pp. 1476-1483, 1600, 1601

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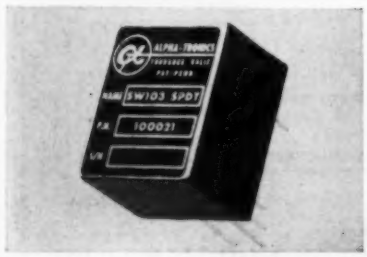
SOLID-STATE CHOPPER [*Alpha-Tronics Corp.*]

Less Than 0.5 Cubic Inch



Solid-state chopper SW-103 operates from dc to 10 kc and requires no external circuitry or adjustments.

Its 50 μv rms noise level at 1 kc makes possible switching of d-c signals in the low mv range. The low back current generated by the chopper, permits utilization of signal-source impedances ranging from 0 to 10K ohms without adverse effect on the d-c offset.

The switching transient does not exceed 4 mv and decays to 37% in 5 μsec. Dwell time is less than 10° at 1 kc.

Having an average operating life of 10,000 hours, the chopper operates continuously at 125°C.

Completely welded and encapsulated, the unit weighs less than 9 grams and measures 0.95" x 0.75" x 0.68".

PRICE: $180.00 ea (1-10). **AVAILABILITY:** 30 days. **MFR:** Alpha-Tronics Corp., 1033 Engracia, Dept EP, Torrance, Calif. **SALES MGR:** James Henry, FA 0-1922

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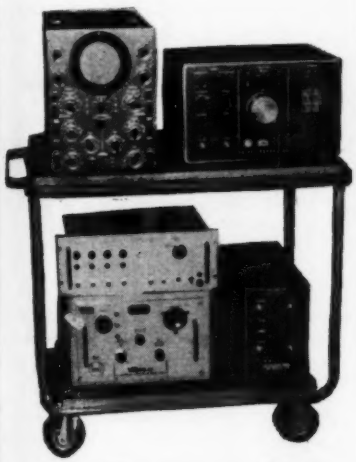

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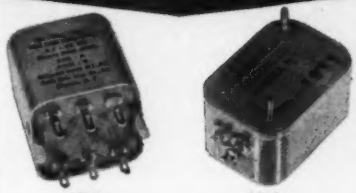

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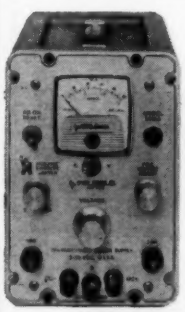

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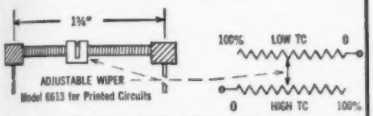

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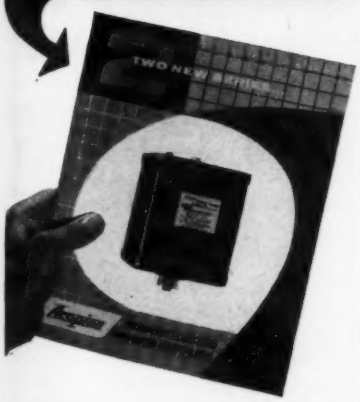

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If you have a product now in the planning or drawing board stage, you can submit it for editorial consideration in the "Opinion Sensor" column. This is a free service for electronics manufacturers. Write for Application Form.

The Editor

FOLD #2

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BUSINESS REPLY LETTER
First Class Permit No. 2051, Hempstead, N. Y.

ELECTRONIC PRODUCTS
MAGAZINE & CLIP FILE

60 MADISON AVENUE
HEMPSTEAD, N. Y.

ATT: Opinion Sensor

OPINION SENSOR

What do you think about these PROPOSED NEW PRODUCTS?

Your candid opinion about the proposed new products described below will guide their manufacturers in planning future production and marketing. Please answer the few questions below, fold and mail. Postage is prepaid.

Proposed New Product No. 60 — *11/61*

HIGH RESOLUTION RESOLVER BRIDGE

SPECIFICATIONS: Has rotor range equivalency of 360° on 0.1° steps. Accuracy to one second of arc ±0.0005%. Nominal output impedance is 600K ohms. Digital readout of angle selected is displayed on front panel.

APPLICATIONS: Simplifies and speeds up calibration, testing, and check-out of resolver components and systems, with high resolution and accuracy through the use of four-arm, center tapped precision-ratio transformers. Ratio values are independent of frequency, normal loading, and waveform effects.

PRICE: $2,500.00 to $3,500.00.

AVAILABILITY: 8 to 10 weeks.

Do You Need This Product? ☐ *Yes* ☐ *No* ☐ *Possibly* — *Probable Quantity*.....

When Would You Need It? ☐ *1-6 mos.* ☐ *6 mos.-1 yr.*

Contemplated Application .....

Suggested Spec Changes.....

Proposed New Product No. 61 — *11/61*

MINIATURE VACUUM TUBES

SPECIFICATIONS: Diodes and triodes ¼" long by 3/32" dia, using beryllia ceramic-metal construction. Tubes use proprietary low-temperature thermionic emitter, with useful emission beginning at 225°C, then following temperature/emission curves for oxide cathodes. Cathode does not evaporate up to 1,400°C.

APPLICATIONS: For miniaturizing conventional equipment, and duplicating conventional tubes where size is a factor. Because of low power input, tubes may be operated in circuits sensitive to high ambient temperatures and radiation damage.

PRICE: Varies with type and specifications.

AVAILABILITY: About 90 days.

Do You Need This Product? ☐ *Yes* ☐ *No* ☐ *Possibly* — *Probable Quantity*.....

When Would You Need It? ☐ *1-6 mos.* ☐ *6 mos.-1 yr.*

Contemplated Application .....

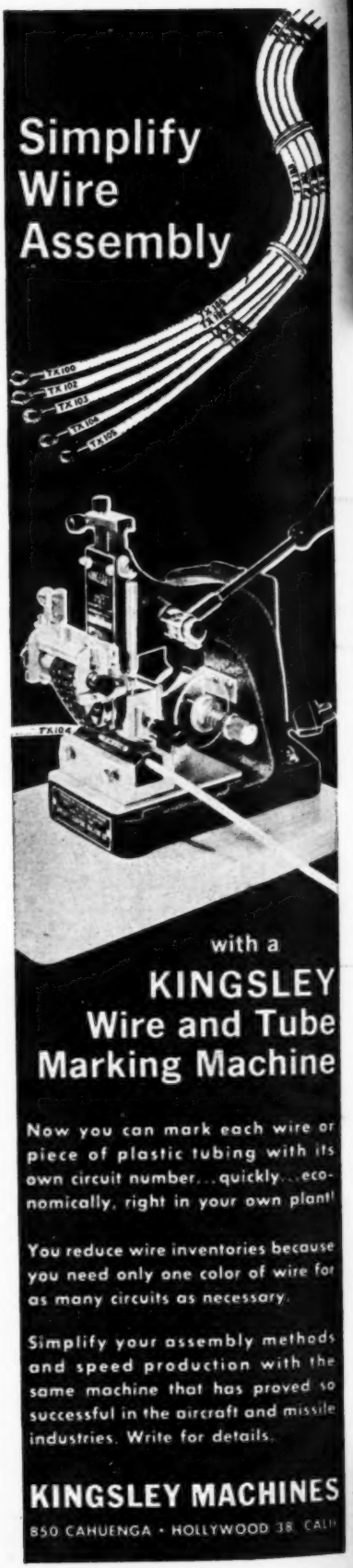
Suggested Spec Changes.....

OPTIONAL

Name.....Title.....

Company.....

Address.....City.....Zone.....State.....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Now you can mark each wire or piece of plastic tubing with its own circuit number... quickly... economically, right in your own plant!
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ELECTRONIC PRODUCTS *Magazine*

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Check ☑ for information or Action required:

- **A** Send further information about product described
- **B** Send catalog on complete line.
- **C** Have sales engineer call.

Name ..... Title .....

Company .....

Address .....

City ..... Zone ..... State .....

Phone No. ..... Ext. .....

#	A	B	C	#	A	B	C	#	A	B	C	#	A	B	C	#	A	B	C	#	A	B	C	#	A	B	C	#	A	B	C	#	A	B	C	#	A	B	C
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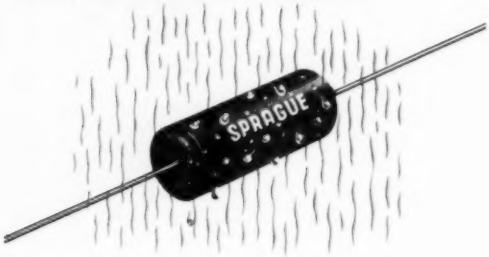
The moisture-resistance curves show how Type 160P Difilm® Black Beauty® Capacitors outperform all other commercial tubulars



To test tubular capacitors, we figuratively brought jungle conditions into the laboratory. The curves tell what happened.

Difilm Black Beauty Molded Capacitors withstood almost 4000 hours (95 to 100% R. H. at 40 C) with *no change in humidity resistance!*

No other tubulars came close to this performance. Difilm Capacitors proved themselves the *true* answer to moisture problems in entertainment and commercial electronics.

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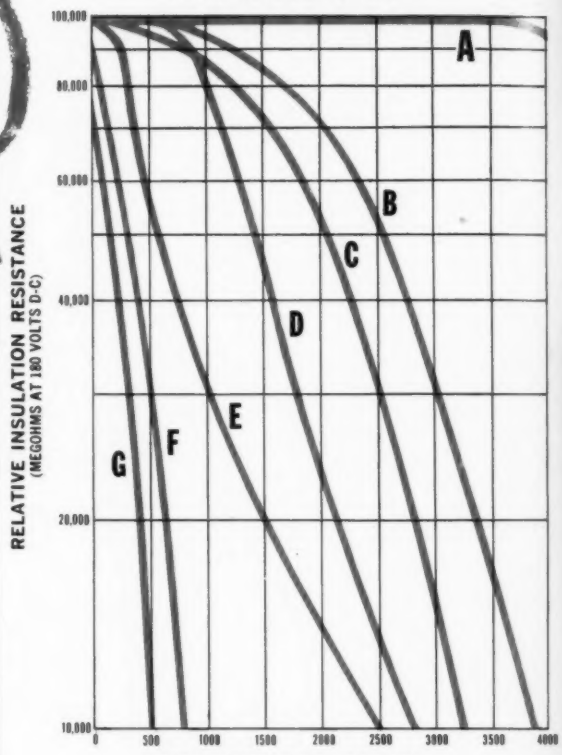
MOISTURE RESISTANCE COMPARISON CHART FOR TUBULAR CAPACITORS



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